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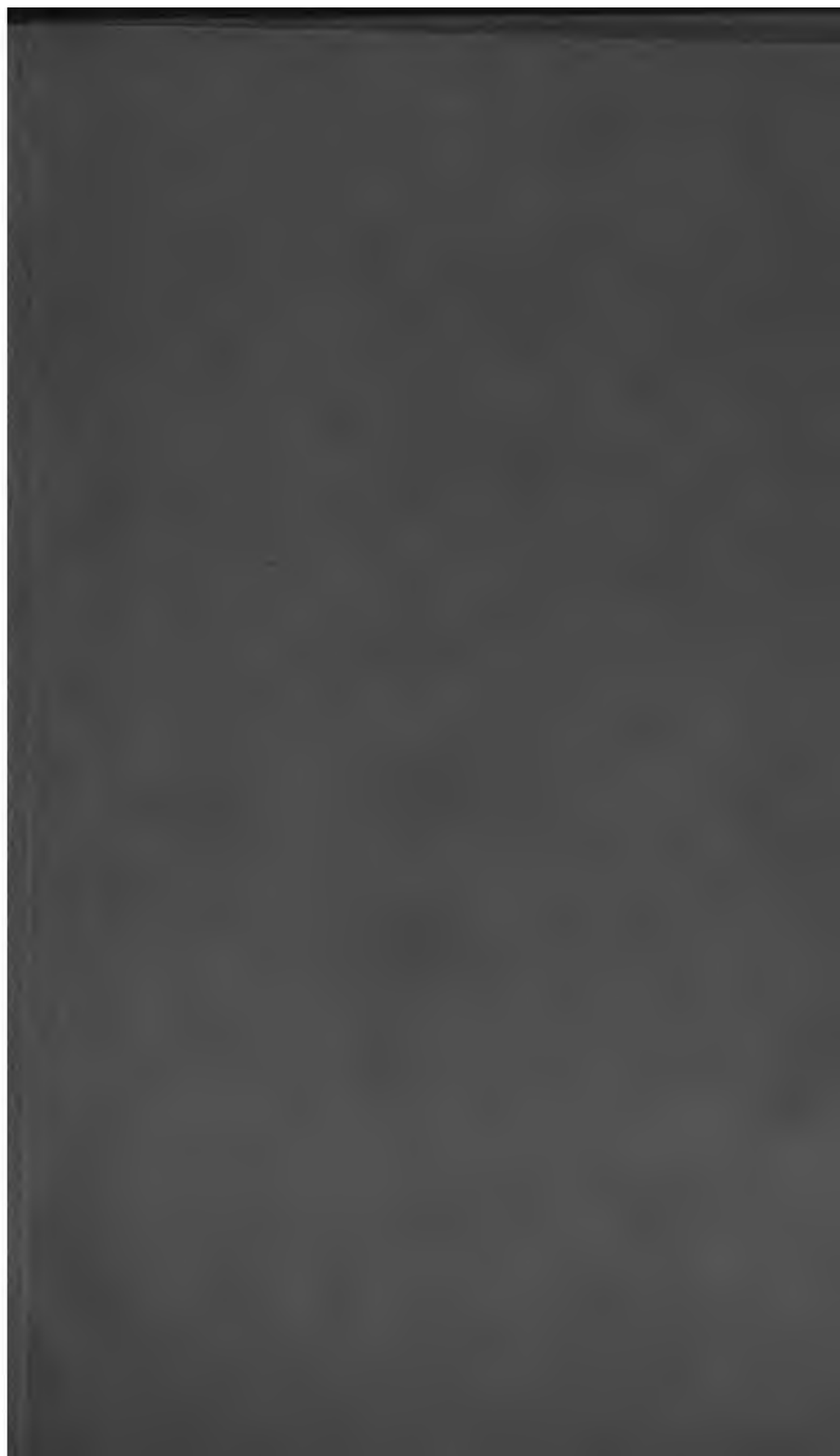
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Jobbing Work

FOR THE

Carpenter

By E. H. Crussell

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JOBGING WORK FOR THE CARPENTER

CHAPTER I

TOOLS AND WORKSHOP EQUIPMENT

THE carpenter's trade covers a wide field and is divided into many branches. We have the ship carpenter, bridge carpenter, house carpenter, and a number of others; some of them very well known, others seldom heard of.

The work of the jobbing shop, without being a separate branch, is a combination of all of them. It is not as much in evidence as was formerly the case, but there is still plenty of this sort of work to do in the line of alterations and repairs, which makes it advisable for the ambitious mechanic to have a working knowledge of it. It is with a view of affording him some suggestions concerning the manner in which work of the character indicated should be done, that the items gathered together under the title of this work are presented. The author worked for a number of years in a shop where little else but jobbing work was done, and some of the work which fell to his lot at that time, and the method of handling it, it will be his humble endeavor to describe. He does not claim that his methods are the only ones, nor even that they are the best; merely, that in the absence of anything better they describe some way of doing it, and he hopes to be able to make up for the lack of style and literary merit of his writings by the clearness and sufficiency of his explanations. There is at the present time, and always has been, a demand for technical information written in the simple language of the workshop, and the work is undertaken with that idea in view. The foregoing will perhaps explain what to some

of the readers may seem a lot of unnecessary information on a series of very simple subjects.

To the uninitiated the title "jobbing carpenter" has a jack-of-all-trades master-of-none sort of sound that is misleading. The jobbing carpenter frequently is a handy man with some little knowledge of other trades, but he must be a lot more than this to be a success. In jobbing work "every tub must stand upon its own bottom." It is not profitable for the boss to attend personally to small jobs on which his gain may be only a dollar or so, he must employ a man of skill upon whom he can depend, and as a large percentage of jobbing work has no precedent, this man must be able to take the initiative and figure ways and means for himself. It goes without saying, that he must be a competent mechanic and able to finish his work in a satisfactory and workmanlike manner, so that he may be able to retain the patrons and bring more work to the shop. All this being so, it will generally be found that the men doing the jobbing work are the oldest and best mechanics in the shop, men who are noted for their ability to do any class of carpenter work well, rather than men noted for their ability to do only one class quickly. To become a really good jobbing carpenter a man should know his own trade thoroughly, have the patience of Job; the wisdom of Solomon; the observation powers of Sherlock Holmes, and the manners of Chesterfield. If, coupled with these qualifications, he has a knowledge of mind reading and is something of a magician, he will soon find a place where these attainments can be used to advantage. I know, my readers, I know, believe me, I *do* know.

Some Special Tools

At the commencement of our subject probably it will not be considered out of place to say a few words concerning tools and workshop appliances. Of tools, the jobbing carpenter will need all that his pocket and inclinations will justify, and as a general thing they should be the best obtainable. Money spent for good tools is money well invested, while money spent for poor ones is money wasted. Good tools may at the present time be obtained

• • • • •

at a fair price from almost any reputable firm, the difference in quality between the better class of saws, planes, etc., being scarcely more than a matter of individual preference. This being so, it is neither possible nor advisable for the writer to say anything here regarding the selection of those tools that are in every-day use. There are a few others, however, not so well known and yet so serviceable that having once been used they become almost indispensable. It is of these the writer would speak, prefacing his remarks with the statement that apart from their use to him as a workman he has no interest either in the tools mentioned or the manufacturers supplying them.

Combination Square

Foremost among the tools in question may be mentioned the combination square illustrated in Fig. 1 of the engravings. In this tool the workman has a miter and try square which is abso-



Fig. 1.—Combination Square and Level.

lutely accurate, with a blade that may be adjusted to any length from nothing up to 12 in., and which has the advantage over the ordinary squares in that it may be taken apart for placing in the tool chest.

Automatic Drill

The automatic drill, Fig. 2, is another excellent tool that can be made useful in a number of ways. It is just the thing for putting on door checks, transom fittings, and such like hard-

ware, where the workman must stand on a trestle or stepladder. Being worked with one hand it can be used in places where a brace and bit cannot. It is also useful for boring nail holes in



Fig. 2.—Automatic Drill.

hardwood moldings, especially in moldings that have been saw kerfed. It is to be understood that the writer does not attempt to point out all the possibilities of any of these tools, but is simply bringing to the notice of the workman a few points peculiar to the tools under discussion.

Folding Drawknife

The folding-handle draw knife, Fig. 3, tells its own story to any one who has had his fingers cut by the old-fashioned kind



Fig. 3.—Folding Draw Knife.

while hunting for something else in the tool chest. The folding feature in this instance representing a great deal more than a space saver.

Screwdrivers

Stanley's plow plane is also an excellent tool—one that is almost indispensable to the jobbing carpenter. Its capabilities are so well known that it is unnecessary to enlarge upon them here, and the same may be said of most of the spiral screwdrivers at present on the market. In the matter of screwdrivers, I would say, pay your money and get good ones—nothing looks so amateurish as work with the screw heads scratched, marked and perhaps broken through the use of poor screwdrivers.

A handy tool is the ratchet screwdriver with three inter-

changeable blades. Some pieces of hardware take just that number of different sizes of screwdriver to put them on properly and when there is only the one piece to apply, tools of this description are handy as space savers in the carrying box when going out of the shop to do the job.

Useful File Handle

The file handle, shown in Fig. 4, may be bought for a few cents, and can be used for many other purposes besides holding files. In case of emergency it may be fitted with a nail, and used as a scratch awl or brad awl. Half a dozen brad awls of different sizes may be made for one of these handles out of a piece of steel wire, and they will have an advantage over the brad-awls one may purchase, in that they will not pull out of the handle. Ordinary brace bits may be clamped in the handle and used where a brace and bit are either inconvenient or impossible. Small screwdriver blades and pieces of band saw may also be fitted to the handle, but probably enough has already been said regarding this convenient little tool, as the intelligent workman will easily grasp its possibilities.



Fig. 4.—File Handle.

A reamer and countersink for metal are absolute necessities to the jobbing carpenter who aspires to do really good work, a lot of the present-day hardware not being properly countersunk for screws. A hack saw and the commoner sizes of twist drill bits should also be carried in the outfit, as they are the only tools competent to handle the nails so frequently met with in repair work.

Of all the temper-trying things with which the jobbing carpenter has to contend—and goodness knows there are enough of them—old nails take a foremost place, and this brings me to where I am constrained to remark that although as a general thing his tools should be of the best obtainable, it will yet pay the mechanic to have a few duplicates of a cheaper brand—tools that he will not be afraid to subject to rough usage. A set of

cheap boring bits for use in doubtful situations will prolong the life of his good set, and a cheap hand saw with rather coarse teeth and with a soft temper will enable him to keep his good saws in better trim. The reason for a saw of soft temper will be obvious when the mechanic stops to think that in some cases he may have to file it three or four times in one day.

Saw Filing Hint

To the younger members of the craft who are at present beginners in the art of saw filing, this same soft saw, with the coarse teeth, affords the very best of practice. After he has become proficient in filing it, he may then turn his attention to his better saws with their smaller teeth and harder tempers.

Canvas Roll for Boring Bits

A canvas roll, such as is indicated in Fig. 5, is the handiest and neatest thing in which to keep boring bits; much better than either throwing them loose in the till of the tool chest or leaving



Fig. 5.—Canvas Roll for Keeping Boring Bits.

them in the box in which they come from the makers. These boxes, although things of beauty are seldom joys forever, and take up altogether too much room in the modern tool chest. The jobbing carpenter moves his tools around a good deal, and any of them that he can fix up in one of these rolls, such as the smaller sizes of chisels or the cutters for his plow plane, will be all the better for it.

Saw Horses, Size and Construction

Among the first things that a carpenter requires in commencing work are a pair of trestles or saw horses and a work bench,

and right here would seem to be a good place to introduce them to the attention of the reader. The only excuse offered for presenting so simple a matter as the construction of a saw horse is the multitude of weird looking contraptions of all shapes, heights and sizes that I have at different times noticed doing duty for this useful article. The average mechanic gets a different size and shape of saw horse every time he makes one, generally arriving at the proper length for the legs by making them much too long in the first place and cutting them down afterward to suit his requirements. Right here allow me to say that there is no

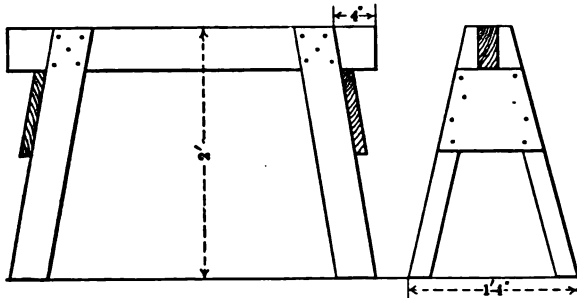


Fig. 6.—Side and End Views of Saw Horse.

need for all this “cutting and trying,” and in the absence of any specific standard it is well for the workman to form one of his own, and adhere to it. In Fig. 6 is shown side and end views of a saw horse, the sizes marked on it being those that have been used by the writer for a number of years, and given entire satisfaction. The length of the top may be varied to suit special conditions, but the height and spread of the legs should remain the same. The size of material shown in this instance is 2 x 4, although, of course, the workman will generally use the material provided him for the purpose, which may be any old size at all; 2 x 4, however, makes a good solid construction, and although a trifle heavy for some classes of work, it is generally the kind of lumber most available.

In Fig. 7 is clearly shown the manner of marking out the leg by means of the steel square. Place the square on the edge of

the material with the 20-in. mark of the blade against one corner, and the 7-in. mark of the tongue against the other; mark along the tongue and around the end of the blade. Fig. 8 shows



Fig. 7.—Marking Out Leg with Steel Square.



Fig. 8.—Appearance of Material After it has been Marked.

the material as it will now appear. Turn it on its side, and place the square on it, with the 4-in. mark of the tongue against one of the marks already made, and the extreme end of the blade against the same corner of the material, all as clearly indicated in Fig. 9. This marks the leg for the necessary batter endwise. Reverse the square and mark the other end of the leg with the same bevel; cut out this leg, and use it as a pattern by which to mark the others, taking care to cut them in pairs. After cutting a sufficient number of legs cut the tops and nail the legs

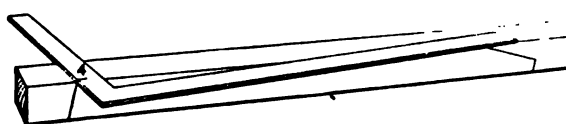


Fig. 9.—Cutting Out Leg for Use as a Pattern.

firmly to them at a distance of 4 in. from the ends. This brings the bottom of the legs in a plumb line with the end of the top of the saw horse. After the legs are on, take a scrap of 1 x 8 and

nail across each pair, close under the top, as shown in the sketches. Cut them off close to the legs, and the saw horse is finished.

Small Trestle

A very handy appliance for the jobbing carpenter is a small trestle about the same height and length as this saw horse, but with a wider top, say, about 9 in., and with a tray fitted in between the legs about 8 in. up from the floor. The whole thing should be made as light as possible consistent with strength, it forming a combined saw horse, trestle and carrying box. It will be found a very handy article for use on small jobs.

Work Bench, Size and Construction

In describing what I consider to be the best form of work bench, I am sensible of the fact that I am very likely to run foul of the ideas of some of our best mechanics. This, however, cannot be helped, for a number of years I have earned my daily bread at the work bench, and have well-defined ideas of my own on the subject. In the first place, I consider the biggest abomination in the form of a bench is the one with a well at the back of it—the one in which the front plank is 2 or 3 in. higher than the rest of the bench, leaving a depression at the rear side which answers no useful purpose, and is always full of nails, shavings and rubbish. The ideal surface for a bench top is one that is perfectly flat and level. A bench of this kind can easily be cleaned off, the tools will stay in their places on it, and when one has a wide panel or something similar on which to work he can do so without putting blocks of wood at the back of the bench to make it the same height as the front.

At one time I labored under the impression that drawers in the front of the work bench were good things, but I have been forced to the conclusion that they are more of a nuisance than blessing. There is nothing more exasperating than to have a large piece of work, such, for example, as a counter top, fastened in front of the bench and discover that it is necessary to remove it in order to get at some tool which is reposing in a drawer be-

hind it. After one or two lessons of this kind the mechanic is very apt to decide that there are handier places in which to keep tools than bench drawers.

What I consider a good bench for shop purposes is shown in front elevation in Fig. 10, and in end elevation in Fig. 11. For

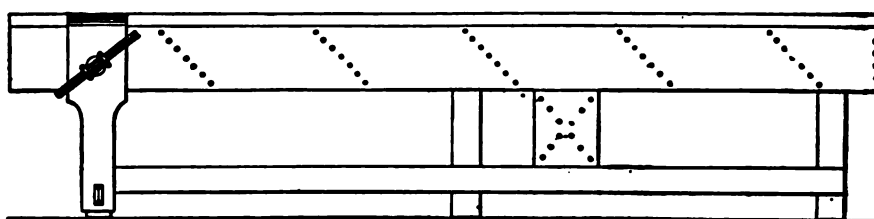


Fig. 10.—Front Elevation of Work Bench.

jobbing work the bench should not be less than 12 ft. long and may, if there is sufficient room, be as much as 16 ft. in length. As regards width it may be from 2 ft. 4 in. to 3 ft., and in height from 2 ft. 6 in. to 2 ft. 8 in. An English authority gives the height as 2 ft. 4 in. Of course, it depends somewhat upon the class of work to be done, but any one who would need a lower bench than this would certainly answer to the name of "Shorty."

In order to keep the bench top straight and prevent it from sagging in the center, it should have plenty of supports—three

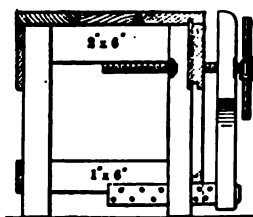


Fig. 11.—End Elevation.

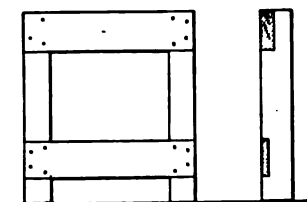


Fig. 12.—Details of Bench Support.

in a 12-ft. bench, and 4 in a 16-ft. bench. One of the supports is shown in end and side elevation in Fig. 12. The legs are 3 x 4 in. or 4 x 4 in.; the top cross piece is 2 x 6 in., and the lower one is 1 x 6 in. The lower one is kept up from the floor far enough to allow of the passage of a broom under it.

The top of the bench is composed of 2-in. planks square jointed and doweled. Avoid the use of a tongued and grooved joint, because when the top shrinks and the joints open, sawdust, small brads, etc., will get into them, and the tongue will prevent them falling through. It is well not to make the square joints too square, shoot them a little under so that anything getting in at the top will have a chance to get through on the under side. It is perhaps hardly necessary for me to point out that such things as small brads in the joints of the bench top can do a lot of damage to the edges of bench tools or the surface of any work that may come in contact with them. The top of the bench should be fastened securely to the supports with screws in countersunk holes, use two screws in each plank at each support—one close to each edge of the plank to prevent it curling.

The front of the bench is also composed of 2-in. material—the top piece about 10 in. wide, and the lower one 4 in. The lower edge of the top piece and the upper edge of the lower piece are grooved to receive the tongue of the slide shown in the side or end elevation of the work bench, Fig. 11. This slide is made of oak or other hard wood. It is 10 in. wide, and $1\frac{1}{2}$ in. thick. It can be moved from one end of the bench to the other, according to requirements. The front of the bench being 2 in. thick gives a much better hold to the pins that are used for supporting the end of the work opposite that laid in the vise. It also makes it possible to gain the legs half an inch into the front plank, which will overcome all tendency to rack the bench endways, and, altogether, makes a much stiffer and more desirable bench front than the ordinary.

In the end elevation, Fig. 11, the front plank is shown as tongued into the bench top. The reason for this is, continually gripping small pieces in the top portion of the vise soon forces the top of the bench away from the front plank, leaving an uneven surface, which has a tendency to split thin material when gripped in the vise. The tongued and grooved joint is easily made and obviates all this.

Bench Vise

The choice of a bench vise is largely a matter of individual preference. The one represented is of the old-fashioned kind, and the drawings indicate quite clearly the manner of fitting. For my own use, I prefer to have the wooden handle of the vise driven tightly into the socket of the screw, so that an equal portion projects on each side. It is much easier to get hold of and quicker to work with than when left loose in the socket.

Bench Stop

The bench stop should be bought. I have probably made and tried as many home-made bench stops as most mechanics, and believe that the poorest bench stop on the market to-day is as good as the best home-made one, while a lot of them are better. The chief advantage of the boughten one is ease and nicety of adjustment, this being especially noticeable when one is planing thin material.

Before the bench stop is fitted the top of the bench should be dressed off perfectly flat and straight in all directions, and when fitting the bench stop it should be sunk a little below the surface of the top of the bench. The holes that are bored in the front of the bench for the supporting pins are 1 in. in diameter, and should all be bored in some kind of regular order, when the bench is first made. The pins should be turned, and it is a good scheme to paint them vermilion. The turned pins are not so liable to be thrown away as are whittled ones, and the vermilion color prevents them getting lost in the shavings.

If the bench is to be a double one both sides should, of course, be made alike, but if it is to stand against a wall a $\frac{3}{4}$ -in. board will be heavy enough for the rear side. In this latter case the top may be made to overhang a little on the back side, so that if the planks of which it is composed shrink very much they may be taken off and clamped up tight again.

After the bench is finished it should be set up level in the position it is to occupy, and the legs should be scribed and fitted to the floor. After this, if one feels like going to the expense of a coat of hard oil finish for the top of it he will be surprised

at the extra length of time the bench will stay in good condition.

I presume there are mechanics who will think that a bench built to these specifications will prove an unnecessary waste of time and material. Well, we cannot all think alike, and it has been my experience that the extra facilities for doing good work as afforded by a bench of this kind over the rattle-trap affair usually constructed will in a short time pay for the entire cost of the bench, in addition to which the workman will take more care of it, and keep it in better order.

There are other workshop appliances that the workman requires, and it is my intention to touch upon them a little later, but for the present will leave this part of the subject, and commence work in earnest. Our first example will be the cutting of a doorway through a lath and plaster partition wall.

CHAPTER II

CUTTING DOORWAY THROUGH A PARTITION WALL

ALTERATIONS form a large part of the jobbing carpenter's work and frequently involve the cutting of doorways or other openings through existing walls. To do any work of this nature in a brick wall the carpenter must call to his aid the services of bricklayer and plasterer. In a wooden wall, however, or in one of lath and plaster, he can manage alone, it being quite possible to cut an opening through this latter class of wall and not break any more of its surface than can be covered by a 4-in. casing or architrave, although it is a job that will be attacked with more confidence the second time than the first. It is this latter job that we intend to explain.

The first consideration is the size of the opening to be cut in the plaster, and this will depend, of course, upon the outside measurement of the door frame. If we are using a new door and frame we can at once obtain this measurement and commence cutting. This, however, is not always the case. There are generally plenty of second-hand doors to be found around the premises of a jobbing shop and the boss never lets pass an opportunity of using them, or it may happen that the proprietor of the building has an old door that he wishes to utilize, and as it is a little more difficult to make a passable job with an old door than with a new one, we shall for our present purpose assume that a second-hand door is the one to be used.

Re-fitting Old Doors

In this case it will be better to give the door an overhauling and put it into shape before commencing upon the wall. The amount of work to be done upon it will depend on the kind of usage the door has received. It may be only necessary to run the plane a few times over the striking edge of the door so as to do away with worn corners, or it may be necessary to go all

around the door with both rip saw and plane, making the two stiles of one size and a parallel width. Cutting off or filling up the old hinge gains because the hinges we have will not fit them, and then squaring up the top and the bottom of the door. If the old lock holes in the door cannot be made to fit the new lock without a lot of trouble, it will probably be better to turn the door around and use what was originally the hinge edge for the striking edge of the door. This is especially so if mortise locks are used. Fitting a new mortise lock into an old hole is one of the most thankless tasks of which the writer has knowledge. The old-time locks were generally much larger than those in use at the present day, and to replace one of these old locks with a new one in a neat and satisfactory manner is a job that calls for not only skill and patience, but a whole lot of luck besides.

In filling up old lock holes it will be better to plug the lock mortise first, and then after rebor-ing the holes for the keyhole and knob spindle, fill them with plugs of wood driven in tight and cut off flush. A little liquid glue applied to these plugs is a good thing. Do not cut them so close with the saw as to scratch the surface of the door, for the scratches will show up after the door is painted and the plugs will always be noticeable. Leave a little to be removed with the plane.

If there are any holes or other defects in the door so large that they must be covered by an inlay, cut the inlay diamond shaped, lay it in position and scribe around the edges with a fine scratch-awl, mortise carefully to the lines, apply a little liquid glue and drive home tight. The diamond shape is the easiest to fit and the edges of the inlay should be cut a little under square.

It is not necessary to do all of this work before starting to cut through the wall, but it is necessary to mark out the bad portions of the door so as to get the correct size for the opening. Having obtained this measurement and made the door frame to suit we will commence upon the wall.

Locating and Marking Opening

The ideal situation would be one in which two of the studs came just at the proper distance apart to receive the door frame.

This, however, is something not likely to occur, though if we were cutting an archway instead of a door it could be managed by altering the size of the opening a little. Mark the width of the opening on a rod and by the old-fashioned method of tapping the wall with a hammer, proceed to find the nearest stud on one

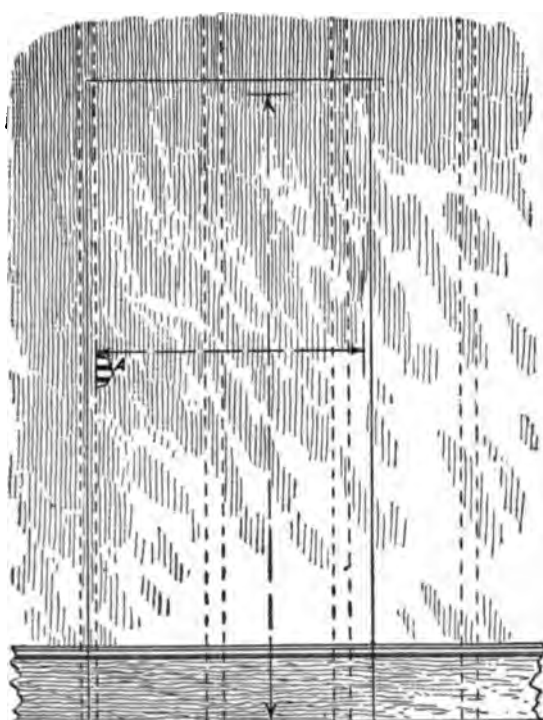


Fig. 13. Wall of Room Marked for Cutting the Doorway.

side. Having located it, ascertain the exact position of its inside edge—that is, the edge or side against which the door frame will rest, by pushing a scratch awl through the plaster and between the lath; then from this edge mark off the width of the opening. Mark a plumb line on the wall at each side of this width, but about 1 in. further back, and a level line across the top about 2 in. higher than the height of the door frame. Mark the other

side of the wall in the same manner. An inspection of Fig. 13 will make everything clear. At A is shown the spot where the edge of the stud was found by means of the scratch awl. The arrow heads show the outside width and height of the door frame. The dotted lines show the studding in the wall, while the full lines are the plumb and level lines inclosing the space from which the plastering is to be removed.

Taking Off Plaster

Having marked both sides of the wall, take a hand axe and, using the point of it, cut through the plastering to the lath all around the opening on these lines. The axe may then be used to remove all the plastering within this outlined space by sliding it along the lath so as to remove the material in small flakes. Use an old bucket or other utensil to catch the plastering as it is taken off, holding the bucket up close to the work with the other hand. This is a much cleaner method than allowing the plastering to fall on the floor and raise clouds of dust. If the building in which the work is being done is occupied the difference between the two methods will be easily noticed and appreciated by the tenant.

Cutting Lath

Having cleared off all the plaster proceed to cut the lath. Cut only one side of the wall at a time, as attempting to cut both sides at once will surely push off some of the lath on the far side and probably a yard or so of plaster with them. Be very careful in cutting the lath on that side of the opening where there is no stud, for it may happen that some of them only reach to the next support, and so will be but short ends after they are cut. Every lath should be held in the fingers of the left hand as it is being cut with the saw, and when cutting the second side where there is room for a longer stroke be very careful to point the saw so that there will be no possibility of hitting the lath on the other side of the wall with it.

It is well to mention that the laths are not cut close back to the plaster, but are cut flush with the edge of the stud on one

side and about $\frac{3}{4}$ in. from the edge of the plaster on the other. It is much easier to cut the opening in the plaster large enough in the first place than to enlarge it afterward, and the projecting edges of the lath enable us to nail them to the new stud that must be put in on that side.

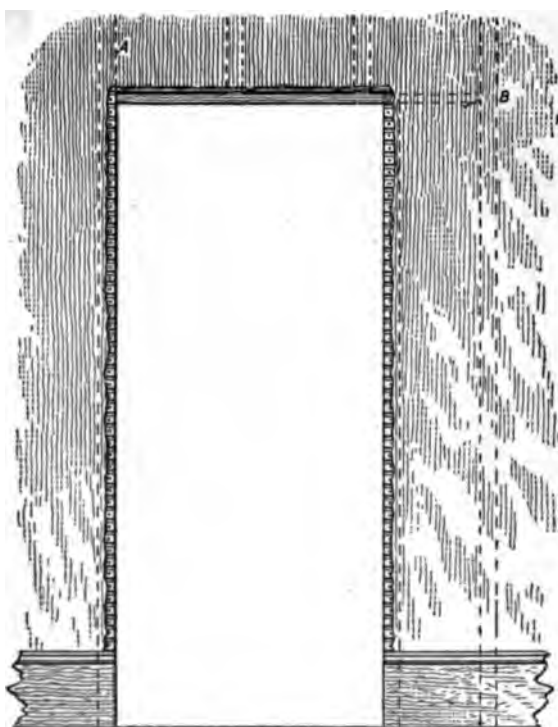


Fig. 14.—The Opening After It Has Been Cut.

After cutting and taking off the lath cut and remove the baseboards and then cut through the studding at a point 1 in. higher than the height of the door frame and take them out. Cut out also the piece of studding in the bottom of the opening and fill up the hole in the floor.

Nailing Header

Prepare now a piece of 1-in. board as wide as the studding and long enough to reach between the inside edges of the studs marked A and B in Fig. 14. Nail this piece of board as a header in the top of the opening, fastening the ends of the studs that have been cut to it, and the ends of it to the studs A and B. The nailing at B may be accomplished by starting the nails into the board before putting it into position and driving them afterward with the help of a long punch or drift. In the absence of any special appliances for this purpose the nails may be reached and driven with the help of a strong screwdriver. If there is room for it a piece of stud may be used instead of a board, but be careful not to get more space above the door frame than the casing will cover.

Take now one of the spare pieces of studding, cut it the proper length to fit between the header and the floor, and after removing the "key" of the plastering on the inner sides of the lath insert the stud and nail fast. It should be set perfectly plumb and at the proper distance from stud A to receive the door frame, after which the projecting ends of the lath are nailed to it. The opening as it will now appear is represented in Fig. 14.

It is not the intention of the writer to go minutely into the methods of setting door frames, but mention might be briefly made that, as it is by no means certain the stud marked A will be exactly plumb, the door frame should be nailed to the piece of studding we have just put in, and whatever packing, if any, is necessary should be done between the frame and the stud A. There is also a possibility of the wall not being plumb sideways. If so, the frame should be set to counteract this as much as possible.

Piecing Out Door Jamb

It may be that after cutting through the wall we shall find the jambs of the frame are too narrow. If the difference is only $\frac{1}{4}$ in. or so it need not be noticed. If it is much more than this, however, it will be necessary to piece out the frame. A neat way of doing this is to work a bead of the proper size on the face of a

board, cut it off and nail it to one edge of the jamb. Fig. 15 shows how the bead is made and where it is cut, while Fig. 16 shows it applied to the edge of the jamb and the manner in which the casing covers it.



Fig. 15.—Showing How the Bead Is Made. — Scale, One-half Full Size.

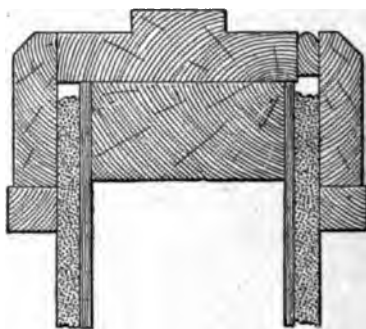


Fig. 16.—Showing How Bead Is Applied to Edge of Jamb.

After the frame is set obtain the exact width of the casings and cut the baseboards back far enough to permit of them being placed in position. The casings supplied us may be the same as those in other parts of the building or they may be only square edged boards. Fig. 16 shows an easy method of relieving the square edged board of a little of its plainness.

We do not intend at this point to give instructions for hanging the door, but would simply remark that the hinges and other trim should be located on the door, not according to your own practice, but to correspond as nearly as possible with the trim in the other parts of the room.

With the door properly hung and the lock fitted, our job of cutting in a doorway is finished. We have endeavored as far as possible to cover every point likely to arise in a job of this kind, and would draw the attention of the young mechanic to the fact that some of the schemes employed, such, for instance, as the piecing out of a door jamb with a bead, were inserted not entirely because of their application here, but as much because they will be useful in other instances of the jobbing carpenter's daily work.

CHAPTER III

STORE COUNTERS

Choice of Woods

THE jobbing carpenter is often called upon to make alterations to store fixtures, such as counters, shelving, etc.

As a general thing it will probably be the lengthening or shortening of them, or moving them from one location to another, but occasionally it may be to construct an entirely new piece. As, therefore, the making of a counter affords us an opportunity to discuss a number of items often met with in the mechanic's daily work, we will take it as a subject for comment in the present chapter. It is not the intention to discuss the design or the choice of woods, as this is something with which the workman will have but little to do. In making alterations or repairs he must, of course, be guided by the existing fixtures and make the new portions to correspond with them, while in anything but the very plainest of new work the kind of wood will be selected for him and a design furnished as a guide in his work. The idea is to explain the method of doing the work, more especially as regards the gluing up of the counter top.

Glue, Preparation and Application

In all work in which there is gluing to be done the glue pot should be the workman's first consideration. It takes some little time to properly prepare glue, and much time is often wasted by first preparing the material for gluing and then attending to the glue pot. Often it is found empty and the workman must kill time while the glue is soaked and melted. Of course, there are shops where the glue is kept always ready for use, but these are not the shops we have in mind at the moment. There are also various kinds of liquid glues to be had, and doubtless they have their uses, but in any work of which you wish to feel proud it is much better to place your trust in the old reliable. Although

a little more trouble to prepare, it has the advantage of setting quickly and will set about as well in wet weather as in dry.

Much has been written upon the subject of glue, but there is still room for further information, and as it is absolutely impossible to make a perfect glue joint with poor glue, a few words on this theme may not be thought amiss. Glue in its dry state should be hard, tough and semitransparent. To prepare it for use break it into small pieces, place it in the inner vessel of the glue pot, cover it with clean, cold water, and leave it to soak for a number of hours. The usual method is to let it soak over night. After it has been soaked, fill the outer vessel of the glue pot also with clean water and apply heat. The water in the outer pot should boil and so continue until the glue is melted. The hotter the glue the stronger the joint, and in all large and long joints it should be applied immediately after boiling. By frequent remelting glue loses much of its strength, and in all work of importance it is best to be on the safe side and make fresh glue. Be sure and have clean water in the outer pot, because it is nearly always necessary to add some of this water to the glue in order to bring it to the proper consistency, and if it is dirty or greasy it will surely spoil the glue. It is possible to prepare glue for use without the preliminary soaking, but it must always be covered with water, and unless the glue is wanted immediately the method of soaking is best.

As already mentioned, it is nearly always necessary to reduce the glue after it is melted, and it requires some little practice to get this just right. The novice, in an endeavor to make the glue strong, generally makes the mistake of having it too thick, which is very probably the cause of most of the trouble in the matter of making glued joints. Experienced workmen test the glue by dipping in the brush and allowing the glue to run from the end of it. The glue should run freely, but not break into drops; if it does it is too thin, while if the last portion hanging to the bristles curls up the glue is too thick.

This method is not always reliable because different grades of glue vary too much. The surest method is to make a test as follows: Take a small piece of board a few inches square and

run a brush full of the glue on it. Hold it in the hand a little longer than you think it will take you to glue and cramp up the joint, and then try it with the forefinger; if it is still soft and does not feel sticky it is not too thick for your purpose. Wait a little longer and then try again. It should now begin to drag and feel sticky. If it does not do so in a reasonable length of time it is too thin or the glue is poor.

A good glue joint is stronger than any other part of the board, and will still hold together though the board be broken into pieces. This kind of joint is easy enough to make in pine or any of the soft woods, but to do as well in quarter sawn oak or maple requires the best of material and favorable conditions.

If the work is being done in the winter time it is essential that the shop be warm and free from drafts, especially if the job is of any size. It is impossible to make good joints if the glue chills before they can be brought together. Shops and factories that have much gluing to do usually have a special compartment for this purpose, but the jobbing shop seldom has room for this sort of thing and is often cold and drafty. The mechanic who has conditions of this kind to contend with can overcome them somewhat by standing his material around the stove so as to have it thoroughly warm, and by doing the gluing in two or three operations instead of in one. It may perhaps also be well to bar the door so as to prevent any one opening it and allowing a cold blast to fall upon the work in the midst of the performance.

What we mean by two or three operations is as follows: Suppose our counter top is composed of four pieces necessitating three joints. Under favorable conditions it would be easy to glue and cramp all of the joints at one time, but in a cold shop the glue would chill long before this could be accomplished, so we first glue the pieces together in pairs and when dry glue together these two pairs.

Perhaps some of my readers, who are accustomed to ideal conditions of material and work shop, will smile at the above methods, and would perhaps refuse to conform to them. The jobbing carpenter, however, must wherever possible "deliver the

goods," his creed being that difficulties encountered in his work are the only means he has of showing how much smarter he is than the other fellow.

Glue Joints, Various Kinds

Having made certain that our glue will be ready for use when we need it we will now prepare the lumber. Joints of various kinds are shown in Figs. 17 to 20, inclusive. In Fig. 17

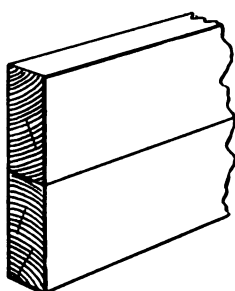


Fig. 17.—A Square Joint.

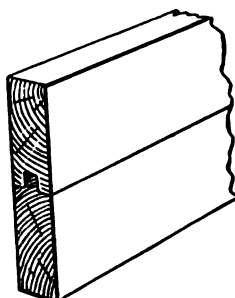


Fig. 18.—A Matched Joint.

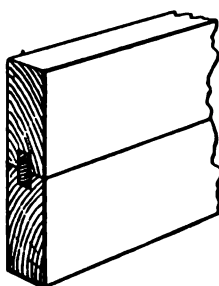


Fig. 19.—A Tongued and Grooved Joint.

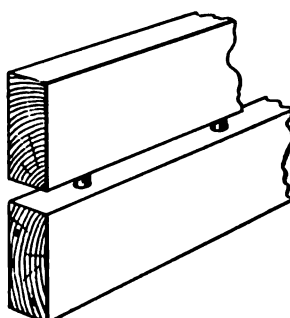


Fig. 20.—A Doweled Joint.

is represented a square joint; in Fig. 18 a matched point; in Fig. 19 a tongued and grooved joint, and in Fig. 20 a doweled joint. Authorities differ as to which is the best form, but the writer's preference is for the square joint in all material up to $\frac{1}{2}$ in. thick, and for the doweled joint in thicker material.

A former writer on this subject has claimed that the matched or tongued joint is the stronger because there is more surface for the glue. This somehow brings to mind the story concerning the old woman's table top, which was a classic in the shop where the writer was an apprentice. In explaining why the table top fell to pieces the old woman said, "'Twas no wonder, for the glue in it wasn't no thicker than a penny piece."

Matching the Grain

We will first attempt the square joint. Having cut the boards to the proper length, which will, of course, be an inch or so longer than the finished size, arrange them on the trestles in their proper order. If the material is quartered oak or other figured wood, endeavor to place the pieces so that the figure will show to the best advantage and assist in concealing the joint. The board may be a few shades lighter on one edge than on the other. With a light and a dark edge together, no matter how good the joint, it is always noticeable, while with the two light or the two dark edges together it may be made almost imperceptible.

Arranging Boards to Prevent Warping

In wood that is to have a painted finish the matching of grain and color is of no importance, and in this case it is best to arrange the boards as in Fig. 21, with the heart side of the

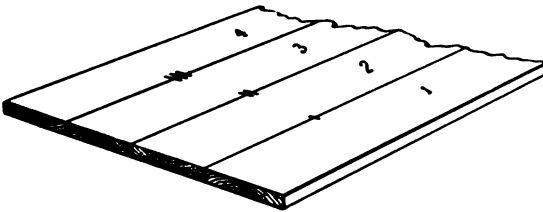


Fig. 21.—The Boards and Joints Numbered.

board alternately up and down. This arrangement helps to build up top in better surface, as each board to a certain counteracts the curl or warp of the one next to it. Num-

ber the boards and also the joints as shown in Fig. 21. It would be better to form a habit of using blue crayon for this purpose, as it can be much more easily removed from the surface of finished lumber than can marks made by a black lead pencil.

Shooting the Joint

Place board No. 1 joint edge up in the bench vise; shoot the edge straight and as square as possible. The edge should be just the least bit hollow lengthwise. When you have it about right lay it on the bench and dress up joint No. 1 of board No. 2. Place board No. 1 on top of board No. 2 as it sets in the bench vise, and test the joint both for squareness and straightness. If the joints are square the boards will stand one above the other in a plumb line. If they are not, the top board will lean one way or the other and a shaving must be taken off one side of the lower joint in order to bring the boards plumb. In most material up to $\frac{1}{4}$ in. thick there is likely to be some little warp, in which case the joint must be dressed so that the boards stand plumb or straight with each other in the center of their length, allowing one end to lean a little one way and the opposite end to lean about as much in the opposite direction. If the joint is correctly made the cramps will pull them straight.

As mentioned above, the joint should be a little hollow lengthwise; that is, the boards should only touch at their ends. This is to counteract the effects of the cramps and insure the joints being good at their ends. All poorly made joints open at the ends first, which is, of course, the place where the air gets the best chance at them. If you take two boards and make the joint between them as straight as possible, so that they touch their entire length, and then apply a cramp to them in the center, it will be found that the joint will open at the ends, and the tighter you make the cramp the further they will open. Glue in the joint will make the situation worse instead of better.

The amount the joint should be hollow varies with different thicknesses, lengths and widths of material. Experience can guess right practically every time, but the novice may have to make one or two trials to get it exactly correct. The joints

should be so that when the cramps are applied they are tight together for their entire length and on both sides—so tight that any part of one board may be tapped into line or out of line with the surface of the other and will stay so.

Testing the Joint

A test to determine if the joint is truly hollow is as follows: As the boards are standing one above the other in the bench vise, grasp the upper board with the thumb and finger at the lower corner and slide it first to one side and then to the other. If the joint is true the far end of the board will stay in its place, while if there are any high spots in the joint the board will pivot on them and the far end of it will swing in the opposite direction.

Having perfected the joint as nearly as possible, lay board No. 1 back on the trestles, reverse the edges of board No. 2 in the bench vise then continue as before, trying board No. 2 on top of board No. 3, and so on until all joints are made. When all the joints are completed apply the cramp or cramps with the joints dry and rectify anything that requires it. It is just as well to have cramps enough, but do not try to make up for the lack of skill in handling the plane by breaking the cramps. Above all things, be sure your joints come tight at the ends.

Arranging Boards for Gluing

With the joints all made the last thing is to apply the glue, but we must first place our boards in some kind of order so that the gluing may be done expeditiously. In our present example we have four boards, the two outside ones having only one edge each to be glued, while the center ones are glued on both edges. Arrange them one on top of the other, as in Fig. 22, which represents an end elevation of the boards as they rest upon the trestles ready for gluing. The numbers and joint marks of the boards have been placed on the ends so as to show the arrangement. Notice that one of the outside boards has been turned upside down so as to bring both joint edges on the same side of the pile. Move the top boards over a little and glue the two edges

on one side of the pile first; then move them back flush again and glue the side with the four edges. Turn board No. 1 the right way up and place it at the far side of the trestle; place

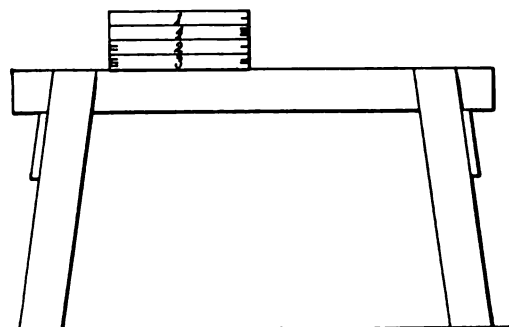


Fig. 22.—End View of Boards Arranged on Trestles Ready for Gluing.

board No. 4 in position, touching board No. 3; drop board No. 2 in between No. 3 and No. 1; pull them all together, making their ends even; apply the cramps and screw tight. Tap the surfaces of the boards into line and set the work one side for the glue to harden. When there is much gluing to be done it is a good scheme to fasten triangular strips of wood to the tops of the trestles, as one need not then be so very particular about touching the tops of the trestles with the glue brush.

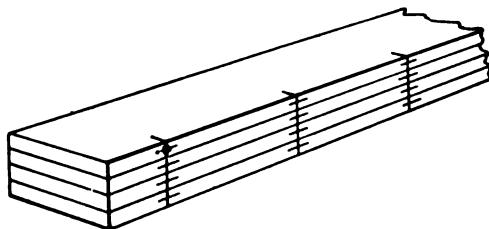


Fig. 23.—Boards Piled for Marking Dowel Holes.

Doweled Joints

In making doweled joints proceed in exactly the same manner as for square joints. Try the cramps while the joints are dry and before inserting the dowels. If everything is O. K. mark

the position of the dowels and bore the holes for their reception with a clean cutting bit. The general method of marking for the dowels is to pile the boards face to face on top of each other and square down the edges as shown in Fig. 23. The writer, however, secures the best results by laying the boards out flat, as in Fig. 21, marking across the face of them at the joints and then squaring down the edge of each board separately. Run a gauge mark long the center of each edge from the face side of the board. In such wood as oak or ash it is better to make an entrance for the nose of the bit at the exact intersection of these marks with a scratch awl or some such instrument. It is remarkably easy to get the holes for the dowels out of line with each other and the coarse grain of these woods will even turn the nose of the bit out of its course when it is first entering.

A Dowel Plate

Most shops keep a small stock of hardwood dowels on hand, but the best and strongest are those that are split out of straight grained stock, roughly dressed to size and finished by being driven through a dowel plate. A dowel plate is nothing but a piece of steel about $2\frac{1}{2}$ in. wide, 4 in. long and $\frac{1}{2}$ in. thick, with several holes of different diameter drilled through it. With one of these plates in his "kit" the carpenter can always be sure of his dowels being the right size for his boring bits.

Glue Brush for Dowel Holes

In putting doweled joints together remember to glue the holes for the dowels. It will not answer to simply glue the dowels, because most of the glue will be scraped off as the dowel enters. Two or three pieces of wire twisted together will make a brush for putting the glue into the holes. Do not make the dowels too long, and be sure and bore the holes deep enough. To make the dowel an inch in length for every $\frac{1}{2}$ in. in diameter is a fairly good rule; for instance, a $\frac{3}{4}$ -in. dowel should be about 3 in. long. It is well to use a depth gauge when boring the holes so as to keep the dowels equal in each board and prevent them backing up, which they might do if bored in too far. In gluing up, glue

the holes first, then the edges or joints; drive in the dowels and cramp up.

In an endeavor to make everything clear we have used a lot of space explaining the working of these joints, but we hope so much explanation will not cause the novice to think there is anything impossible, or, indeed, even very difficult, in the making of them. In our own case we find it very much easier to turn to and make them than to sit down and tell on paper how they are made.

Cleaning Off Counter Top

The method of cleaning off our counter top will depend somewhat upon the size of it. Wherever possible it is generally better to straighten the bottom side and the edges and fasten it in place before trying to dress off the top. Where it is not possible to do this, and the top shows a tendency to curl or warp, two or three stout cleats may be temporarily fastened to the under side of it, but even then the final smoothing off should be left until the top has been fastened in place.

To make a good job of the cleaning off, the planes must be in good condition and the plane irons kept sharp. An iron jack plane is preferred by the writer for the first part of the job, especially for hardwood. First get rid of any glue there may be on the face of the work, and then commence to level the surface of the top by planing it crossways of the grain, not exactly square across, but at an angle of about 80 degrees. This is the quickest method of reducing the top to a level surface, but the plane must be kept very sharp and not have "too much iron," as it is liable to tear out the fibers of the wood and make the final cleaning up a much longer process.

After planing crossways until every part of the surface has been touched with the iron, finish off lengthways with the trying plane and smooth plane, using sandpaper on soft wood and a steel scraper on hard wood for the final finishing off.

Sandpaper and Scraper

The sandpaper and scraper are used for removing the plane marks which may not be noticeable when the wood is in the

white, but which will surely show up after it has been painted or varnished, no matter how carefully the planing has been done.

Nosings for Counter

The molding on the edges of the counter should be worked before this final scraping or papering. A nosing is most commonly used, and it may be either a full semicircle as in Fig. 24



Fig. 24.



Fig. 25.



Fig. 26.

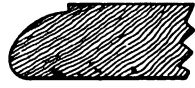


Fig. 27.

Various Styles of Edge Moldings.

or a segment as in Fig. 25. The segment is the easier to work and in most cases looks better. Figs. 26 and 27 show two other styles of edge molding, both of which are easy to make and require no tools other than those usually found in the carpenter's "kit."

Fastening Counter Top

Figs. 28 to 34, inclusive, show various methods of fastening such work as counter or table tops. In Fig. 28 the fastening



Fig. 28.—One Method of Fastening Counter Top.

is by means of screws in countersunk holes, which are afterward filled with plugs of wood of the same kind as the counter top and having the grain run the same way.

Plugs for Screw Holes

Plug cutters may be purchased that will make these plugs to perfection, although it is possible to make them without any special tool. To make them one at a time would be quite a

job, but if we cut a small strip from the end of a board 6 or 8 in. wide it is quite easy with a finely set plane to reduce this strip to a cylindrical form in the same manner as if the grain ran

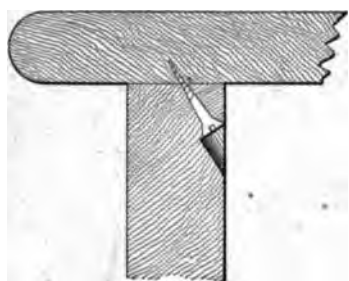


Fig. 20.—Method of Fastening with Screws from the Under Side.

lengthways instead of across it. The ends of the strip will chip a little, of course, but there will be a number of good plugs in the center of the piece.

When boring the holes for the screw heads it is better to measure than to guess at the size of them. Screw heads are larger than they look to be, and forcing one through a hole a trifle too small for it will mar the edges of

the hole, so that the plugs will not properly fit.

In Fig. 29 is shown a method of fastening with screws from

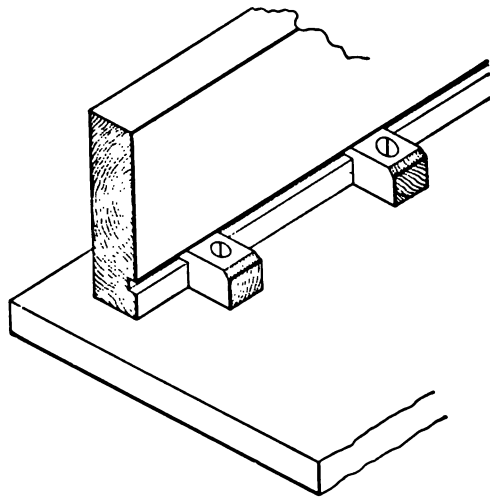


Fig. 30.—Fastening Top so as to Allow for Swelling or Shrinking.

the under side. The easiest way to work this is to first bore the holes for the screws from the upper edge of the framing and cut the recess for the head afterward. Owing to the manner in

which the screw enters, it is well to hold the pieces together with hand screws or clamps while making this fastening.

Fastening with Buttons

A method of fastening the top which allows it to swell or shrink without splitting or breaking the joints is illustrated in Fig. 30. A groove, or in some cases a rabbet, is plowed on the inner sides of the framework and the top is fixed with screws and small pieces of rabbeted wood called "buttons," that fit into the groove. In making the buttons it is quicker to cut the rabbet across the end of a wide piece of board, bore all the holes for the screws and thus make several at once, as indicated in Fig. 31.

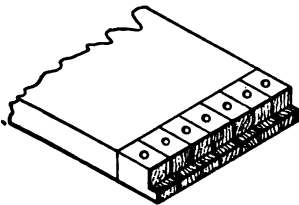


Fig. 31.—Making Several "Buttons" at One Operation.

With Screws in Slotted Holes

The method presented in Fig. 32 will also allow the top to swell or shrink. In it a strip of wood is fastened firmly to the

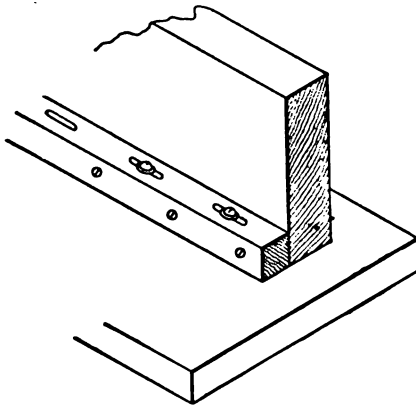


Fig. 32.—Another Method of Fastening so as to Permit of Shrinkage or Swelling.

framework with screws or nails, and the top is fastened to this strip by means of screws passed through slotted holes. Round

headed screws are used, with a small washer under the head to enable them to move readily.

A modification of this fixture is shown in Fig. 33, in which the strip is made wider and fixed on top of the framework while the

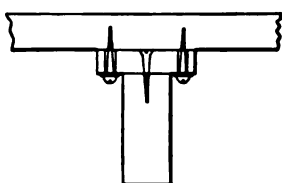


Fig. 33.—A Modification of the Fixture Shown in Fig. 32.

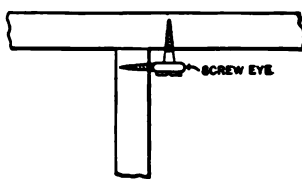


Fig. 34.—A Fastening for Lighter Work.

screws are placed alternately on each side. The writer has used this latter form quite successfully in the construction of large drawing boards.

A Hint for the Workman

It will be noticed that Figs. 30 and 32 are represented as being upside down, which suggests the remark that wherever possible upside down is the proper way to fix such work as that under consideration. Quite often the writer has seen men crawling around on the floor under some small table or stand, working the screwdriver with one hand and holding the piece in position with the other, when the whole thing might have easily been turned upside down on a couple of saw horses and worked upon with comfort.

Screweye Fastening

A fastening which though hardly strong enough for a counter top can be used quite handily for a number of different purposes, such as light table tops, stands or shelving, is illustrated in Fig. 34. It consists of a stout screweye fixed in the framing with a wood screw passed through it into the table top or shelf.

Simple Design for Counter

We have already stated that for work of any importance the mechanic would most probably have a design furnished him, but

a simple design for plain work is given in Fig. 35, which represents the front elevation and cross section of a counter that can be built of the ordinary stock usually found in a jobbing shop. A large sprung molding gives the necessary overhand to the

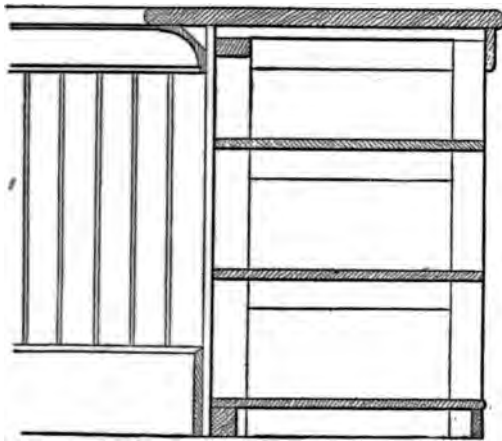


Fig. 35.—A Simple Design for Plain Work—Elevation and Section of a Counter that Can be Built of Ordinary Stock.

top. The front is of beaded ceiling, and a bevel edged board forms the base at the bottom. The framework is of 2 x 3 in. dressed material, and the space under the counter may be fitted with either drawers, cupboards or open shelving, according to requirements.

Moving Counters

In the matter of moving such fixtures as counters from one place to another, the writer finds it rather difficult to set forth any general information. Counters that have been put together in the factory will present no great difficulties, as, of course, they have been brought to the store in sections and can be taken away in the same manner. Counters that have been built in place, however, are usually much longer and heavier, and if they are to be taken from the building in which they were erected to some other one it will probably be necessary to cut them into sections.

Before doing this it will be well to go over the ground thoroughly, both at the old and new locations, so as to be certain everything has been figured out to the best advantage before commencing work.

Take note of everything that is likely to be in the way or cause trouble, such as doorways, staircases, etc., and it is a good idea to use rods cut to the proper length for measurements, unless you are very sure of yourself and never make mistakes.

If the counter is very firmly nailed down, which it is likely to be if built in place, a number of wide thin wedges driven beneath it at or near the supports will in most cases start it going. It is often necessary to fasten temporary pieces to the counter in order to brace it and hold the various parts together, and seeing that the nails which fasten it to the floor must come out some time, it is best to remove them as early as possible before they can do damage to the floors or floor covering. Pieces of gas pipe or even pieces of broom handle used as rollers will assist in adjusting the counter to its final position.

CHAPTER IV

MAKING A CASH TILL

IN the present day of departmental stores and mail order houses, when a cash till fitted complete with an alarm bell and combination lock may be bought for \$1.99, it might possibly be thought that instructions in the method of making one would be both out of date and superfluous. To this the writer would reply that the idea really is instruction in the methods of making a drawer, and that the drawer was made a cash till so as to cover as many phases of work as possible with the one subject. It might be further argued that there are still some people who, in spite of the price, prefer the old-fashioned kind. This the writer can testify from personal experience, he having occasionally been called upon to replace the \$1.99 article with something more substantial and satisfactory.

To make and fit a properly dovetailed, smoothly running drawer, is very good evidence of the workman's ability in the use of his tools, and any one seeing him accomplish this much might safely argue that he could do more. There are various ways of doing the work, but to save space the writer will confine himself to the method he himself has been in the habit of using and purposes opening the subject with a few remarks upon the topic of dovetailing.

Different Styles of Dovetailing

There are shown in Figs. 36, 37 and 38 three general styles of dovetailing. Fig. 36, the common dovetail, is the easiest of all to make, and is used where strength is of more consequence than appearance, chiefly for the corners of boxes and chests or at the back end of drawers. It has some variations, but usually both pins and tails are made of equal size, and in the best work of about the same width as the thickness of the material. In

cheaper work they are often made much wider than this, but if made too wide the shrinking of the material may make the dovetailing practically useless. The writer is pretty certain that

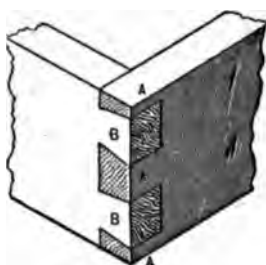


Fig. 36.—The Common Dovetail.

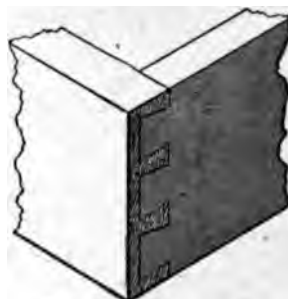


Fig. 37.—The Lap Dovetail.

most of the readers know what is meant by “pin” and “tail,” but a little too much explanation is never out of place, so we will just mention that in Fig. 36 the reference letters A, A, A are the pins and B, B are the tails.

We show in Fig. 37 the lap-dovetail, used chiefly at the front ends of drawers. In it the tails, which are always on the sides of the drawer, are usually made from two to four times as large as the pins. There is no set rule, the workman being governed

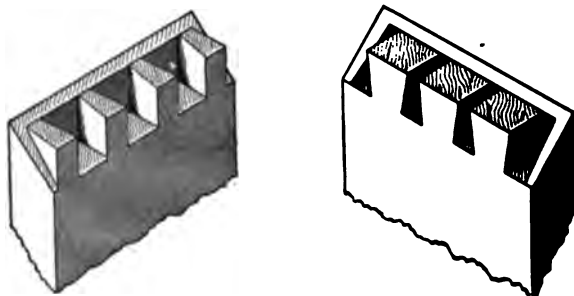


Fig. 38.—The Miter Dovetail.

by his good taste and using a size that will evenly divide his material. Please notice in the figures that the dovetailing **always** starts and finishes with a half pin, which is correct construction.

The miter dovetail is shown in Fig. 38. This is very much more difficult to make than the others, is not as strong as either of them, and is seldom used by the carpenter.

Methods of Marking and Cutting

There are two general methods of marking and cutting dovetails. In one the pins are first cut and the tails marked from them and cut afterward. In the other the tails are cut first and the pins last.

The novice will perhaps think that it cannot matter much which method is used, yet this is a subject that has been the cause of many heated arguments. Briefly, the advantages claimed for each method are as follows: It is easier to cut the pins first and mark the tails from them, especially in lap-dovetailing, in which form the pins are by far the most difficult part of the work, and if they are cut first any little slip made can be easily rectified before cutting the tails. There is another advantage—the experienced workman can train himself to cut the dovetails by this method without using anything for marking the bevels. This we shall illustrate further along. The only advantage claimed for the second method is that when there are a number of pieces all of one size to be cut—say, the sides of a number of drawers—they may be clamped or braded together and all sawn at once, as illustrated in Fig. 39. Some mechanics think this a big saving, but really the sawing of the tails is but a small part of the work, and the writer has some doubt if the time saved by this method will compensate for the increased difficulty of marking and cutting the pins.

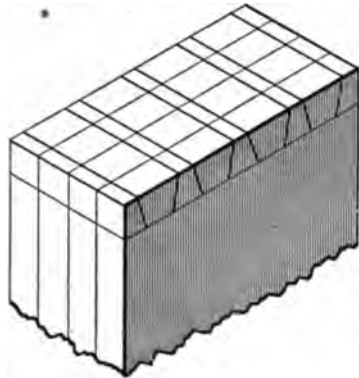


Fig. 39.—Showing Method Where Several Pieces of Same Size are to be Cut.

Interior Arrangement of Till

We show in Fig. 40 the interior arrangement of one style of cash till, of which Fig. 41 is a longitudinal section. The sizes marked are arbitrary and may be altered to suit local conditions, except that the receptacles for the bills should be kept as near as possible to the sizes of the bills they are intended to accommodate. The coin bowls are sometimes made smaller than shown, but more often they are larger. Note the shape of the cavity in them. This is the best form for the easy withdrawal of the coins, and is, therefore, important. The back portion of the till may be left as shown, or divided into spaces to suit the user.

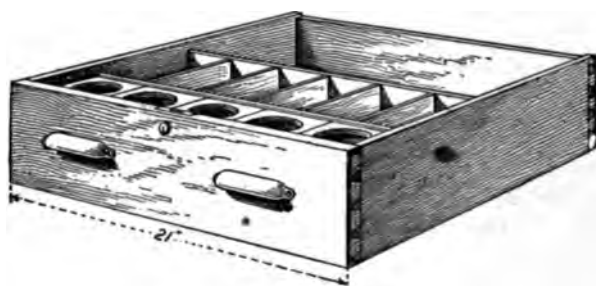


Fig. 40.—General View of Cash Till.

There are other ways of arranging a cash till than that here illustrated. Sometimes the bill spaces are placed at the front, with the coin bowls behind them; in others the coin bowls are all made in one piece and arranged to slide back and forth above the bill spaces. It depends very much upon the space the till is to occupy and the pet notions of the person who is to use it.

Sizes of Materials

The different thicknesses of material mostly used in drawer construction are $\frac{3}{4}$ in. for the front, $\frac{1}{2}$ in. for the sides and back, and $\frac{3}{4}$ in. for the bottom. Usually all the interior or hidden portions are made of pine or other soft wood. It is well to increase the thickness of the sides in a cash till to $\frac{1}{2}$ and even $\frac{3}{4}$ in., and the substitution of hard wood for soft will make the till "run"

much easier and wear much longer. This is a fact often overlooked, although the difference in cost is but a trifle.

In commencing to make a cash till cut out and glue up the bottom first, making it an inch or so longer and wider than the finished size, always remembering that the grain of the wood in the bottom must run crossways of the drawer. It may be jointed and glued in accordance with the instruction for making a counter top in the previous chapter, and should be set aside for the glue to harden while the other portions of the drawer are being made. The inside of the drawer front is the face or working side and the lower edge is the face edge. Many mechanics make the mistake of working from the outside of the

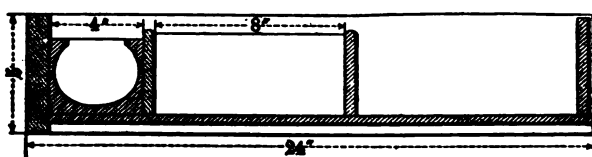


Fig. 41.—Longitudinal Section of Cash Till.

drawer front and get poorly fitting dovetails as a consequence. The inside surface of the drawer front must be dressed perfectly flat and out of wind, after which it is cut to size and the edges made exactly square with the face side. The sides of the drawer are cut about $\frac{1}{4}$ in. wider and longer than the finished size. They are made exactly square on the front and lower edges, while the back and top edges for the present are left as from the saw. The back of the drawer is cut to length, and in width it is made $\frac{1}{8}$ in. less than the inside depth of the drawer. At this point it will pay to notice carefully for a moment Fig. 41 and observe the various details which are involved.

The easiest way to square the ends of the pieces is as follows: "Joint" and square the lower edge first, then mark the exact length and square it across both sides of the board with a knife edge. Use a full sized steel square to do the squaring, and make the knife marks deep. Cut as close as possible to these marks with a fine-toothed saw and take a small corner off the rough edge of the board with a chisel.

Squaring the Sides

The board may now be fixed in the bench vise and the end edge planed as easily as the side. The knife marks serve as an excellent guide for keeping it square and the small corner that was taken off will prevent the boards splintering. A glance at Fig. 42

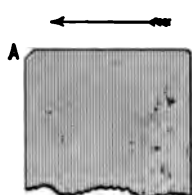


Fig. 42.—Board with Corner Taken Off at "A."

will make everything clear, for at "A" is shown where the corner was taken off, and the arrow indicates the direction of the plane. Of course, this little chamfer must not go further back than the true width of the side. One of the reasons for leaving the top edge of the side rough is to enable us to cut off this little corner. After the ends are squared the top edge of the drawer front is gauged and squared also, but the top edges of the sides are left rough until the drawer is ready for fitting. The back being $\frac{1}{8}$ in. lower than the sides allows this to be done easily. This $\frac{1}{8}$ in. also provides an outlet for the air from behind the drawer, and is a necessity if the top of the drawer comes close up to the framing.

The plow grooves to hold the bottom can now be made, with the top of the groove $\frac{1}{2}$ in. up from the bottom edge of the drawer, after which we can proceed with the dovetailing. Set a cutting gauge just a shaving less than the thickness of the drawer sides and with it mark across the inside face of the drawer front, gauging from the ends; also mark across both sides of the back, gauging from the ends in the same way. This gives us the length of the pins. Now set the gauge to the length of the tails, which should be about three-quarters the thickness of the drawer fronts, and with it gauge a line on the end of the front, working from the face side. Use this same gauge to mark the front ends of the sides, but the back ends must be marked with square and knife edge. The foregoing will explain why it is so necessary to have the ends square both ways.

Fix the drawer front in the bench vise with the inside face toward you and proceed to space out the dovetails. Roughly

mark the pins and tails about the size you want them. After finding how many are required it is easy to make any little alteration in the size so as to have them come out even. The inexperienced workman usually makes the mistake of giving his dovetails too much bevel, which makes them harder to fit and at the same time weakens them. A bevel of about one in six is plenty. You may set a bevel or make a template to these figures if you choose with which to mark out your work, but if you desire to become proficient in the art it would be better to commence to practice cutting the bevels by the eye alone.

With the drawer front fixed in the bench at the proper height for cutting, mark out the spaces and square them down to the gauge line, then take the dovetail saw and, holding it at the proper bevel, cut down this line to the marks. There is just one little thing in this for you to remember. Make all the cuts that point in one direction first—that is, cut only one side of each pin right across the drawer front and then reverse and cut the other sides. If you try it this way you will be surprised how easy it is—much easier than keeping the correct bevel all down a long line of saw teeth, though as we all know practice soon makes even this thing easy—while if you try to cut both bevels as you go along you will find it as hard as it would be to file both sides of the teeth of your saw in the same manner. A study of Fig. 43 will perhaps make the foregoing more easily understood. The light lines show the gauge and square marks, while the heavy lines show where one side of each pin has been cut, and the dotted lines show the bevel of the side that is yet to be cut.

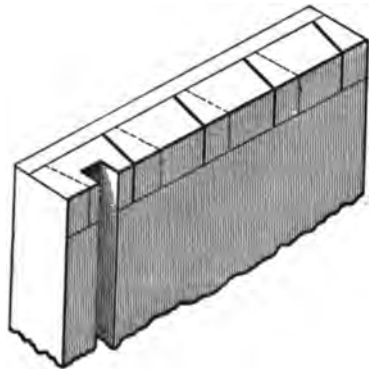


FIG. 43.—Cutting the Dovetails for the Drawer Front.

Chisels for Dovetailing

After the sawing has been done proceed to chisel out the spaces between the pins, great care being required during this part of the work. Do not cut back to the line until you are making



Fig. 44.—Chisel for Dovetailing.

the finishing cuts. If you have much dovetailing to do provide yourself with a chisel, ground as shown in Fig. 44, which is handy for getting into the corners. Notice that it is beveled both sides like a carver's chisel, instead of which you may have two chisels ground on one side only—one right handed and the other left. This, however, means a lot of picking up and laying down of tools.

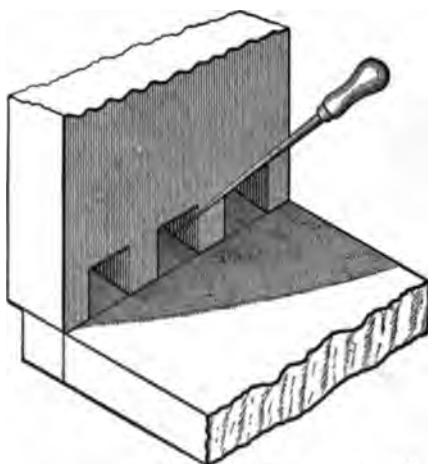


Fig. 45.—Marking the Outline of the "Pins" on to the Side of the Drawer.

When you have the pins finished lay one of the sides on the bench, stand the front over it in the correct position and mark the outline of the pins onto the side with a fine marking awl.

Treat the other side in the same manner. Fig. 45 will explain what is meant. Notice how the gauge line on the side gives the correct position for placing the front. If you wish to make the tails very tight move the front inside the gauge lines just a trifle.

After marking and sawing the tails for the front end the next step is to brad the two sides together, and cut the dovetails for the back of the drawer according to the second method. It

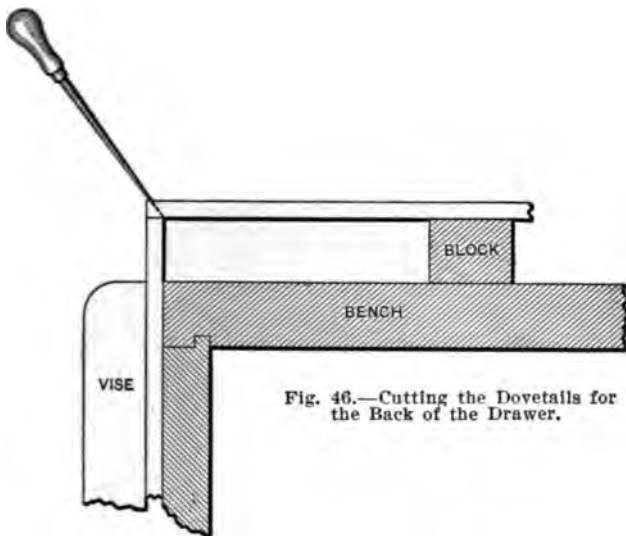


Fig. 46.—Cutting the Dovetails for the Back of the Drawer.

will be found much harder to guess the correct angle for the saw by this method, and it will probably be necessary to use a bevel or template for marking the tails. After they are cut fix the back of the drawer in the bench vise, lay the side in position on top of it and mark the pins. The back is kept up an inch or two from the surface of the bench, and a plane or block of wood laid behind it on which to rest the side. A glance at Fig. 46, which is an end view of the arrangement, should make everything clear.

Beveled edge chisels are the proper ones to use for dovetailing, especially for cutting out the spaces between the tails.

Fitting the Partitions

The cross partitions that form the ends of the bill spaces in the cash till are grooved into the sides, and these grooves should be cut before the till is put together. Indeed, it is good practice to cut these grooves before the dovetailing is finished, in which case the material may be fastened to the bench through the small pieces that are afterward to be cut away. As shown in Fig. 41 the partitions do not run to the top of the drawer but are kept down $\frac{1}{2}$ in. They are first marked out with a knife edge and then a small mortise as deep as the groove and about an inch long is made at the upper end. The balance is then taken out with saw and chisel. The bottoms of the long grooves are leveled off with a router or with a home-made appliance known as an "old woman's tooth," which is nothing but a small block of wood with a plow iron fixed in it and projecting the proper distance. Grooves no longer than those in question can, however, be brought to the correct depth with the chisel alone.

Glue Brush for Dovetailing

The dovetails may now be glued and driven together. Use plenty of glue, but keep it where it belongs, as it is a disagreeable thing to clean off after it becomes hard. It is not always an easy matter to get a glue brush of just the right size and shape for dovetail work, but one may be manufactured from a small piece of tin tubing and a quantity of bristles cut from a 10-cent paint brush. Wind the bristles with thread, insert them in the tube and hammer flat. In this way you can make a brush any size required and one that will not shed its bristles.

While the glue is drying we can clean off the drawer bottom and cut it to size, also make the receptacles for bills. The divisions between these spaces should be made as thin as convenient to work. They are fixed into cross partitions in the same manner that the cross partitions are fixed into the sides of the drawer, and they may be fastened together before being put into place.

Fitting Drawer Lock

It is often a good plan to fix the drawer lock before putting in these divisions, as after they are in there is not much room between them and the drawer front in which to work a chisel or screwdriver. We will not at present discuss the matter of fixing the lock, as it is a subject to be taken up later.

The partitions are inserted from the bottom side of the drawer and the drawer bottom is then slipped into the grooves provided for it. It is fixed at one end only so as to allow it to shrink without splitting. If it is narrow it is fixed with brads at the front end. If it is so wide as to be liable to sag the groove in the front is made a little deeper and the bottom is fixed to the back of the drawer with screws.

Coin Bowls

The coin bowls will, of course, have to be turned. They are a job outside the equipment of the average jobbing shop, and can be made to order quite cheaply outside. In the present example they are made separately and fitted neatly into the space they are to occupy.

Fitting Drawer in Framing

In fitting the drawer, dress off the top edges, smooth up the sides and try it in place. If it binds try it up and down and sideways to find which part wants easing. Sometimes a workman will be planing away at the edges when it is the sides that are binding and *vice versa*. If you run a drawer back and forth a few times it will show a bright spot where it is rubbing. After the sides of the drawer are fitted, clean off the front flush with the framework, and, if necessary, fix a stop to prevent the drawer going in too far. It is best wherever possible to have the back ends of the drawer sides form the stop by butting against the framing.

CHAPTER V

A SMALL BOOKCASE

Purpose of Bookcase

SINCE the advent of the built-in bookcase, china cabinet, etc., the carpenter, when making alterations or repairs, is sometimes called upon to do work involving the construction of small glass doors and woodwork of a somewhat similar nature. In presenting information on this subject the writer has endeavored to make it more interesting by so arranging it that the student may, if he choose, obtain practical experience from it by constructing the article illustrated. The cost of material would not be great while the experience gained by any one not having previously done any of this class of work should be worth a great deal.

The small bookcase shown in the accompanying sketches is not a copy of any found in the furniture stores, but was designed especially to provide storage space for bound volumes of such papers as *The Building Age*. The shelves are movable and may be arranged to take these volumes easily, while the drawer at the bottom will hold the monthly issues, prevent them from getting lost, and keep them clean until they are ready for binding or other disposition is made of them.

The bookcase is designed to stand on a side table and, of course, may be used for other purposes than that mentioned. For example, it would appear to be just the thing for a student of a correspondence school. He could keep the text-books belonging to his course and other technical works in the upper portion of the case, while his writing materials could be kept in the drawer at the bottom. If the table supporting the bookcase was equipped with a good sized drawer in it he could keep his drawing board, with drawing materials, and thus have everything conveniently at hand. The drawing board would be used on the table, and by pulling out the small drawer and resting the back edge of

the drawing board on it almost any slope or pitch desirable could be obtained.

The outside measurements of the bookcase are as follows: 12 in. deep, 2 ft. 8 in. wide, and 3 ft. 10 in. high. Other dimensions are marked on the drawings, which are to scale. All the woodwork in sight should be good figured quarter sawn oak, while that for the back of the case and inside of the drawer may be of pine or other cheap material.

No. Pieces	What For	Thickness	Width	Length	Kind of Wood	No.
2	Sides	$\frac{7}{8}$ "	12"	3'-10"	$\frac{1}{4}$ " sawn oak	1
1	Top	$\frac{7}{8}$ "	10 $\frac{1}{2}$ "	2'-6 $\frac{1}{2}$ "	Plain oak	2
1	Shelf over drawer	$\frac{7}{8}$ "	11 $\frac{1}{2}$ "	2'-6 $\frac{1}{2}$ "	"	3
1	Bottom	$\frac{7}{8}$ "	11 $\frac{1}{2}$ "	2'-7 $\frac{1}{2}$ "	"	4
1	Drawer front	$\frac{7}{8}$ "	8"	2'-6 $\frac{1}{2}$ "	$\frac{1}{4}$ " sawn oak	5
2	Draw styles	$\frac{7}{8}$ "	1 $\frac{3}{4}$ "	3'-0"	"	6
2	" "	$\frac{7}{8}$ "	2 $\frac{1}{2}$ "	3'-0"	"	7
2	" Rails	$\frac{7}{8}$ "	2 $\frac{1}{4}$ "	1'-3"	"	8
2	" "	$\frac{7}{8}$ "	1 $\frac{3}{4}$ "	1'-3"	"	9
1	Rail over door	$\frac{7}{8}$ "	2"	2'-6 $\frac{1}{2}$ "	"	10
1	Cornice cap	$\frac{7}{8}$ "	2 $\frac{1}{4}$ "	4'-6"	Plain oak	11
2	Book shelves	$\frac{7}{8}$ "	10"	2'-6"	"	12
1	Cornice moulding	$\frac{1}{8}$ "	1 $\frac{1}{4}$ "	4'-6"	$\frac{1}{4}$ " sawn oak	13
2	Drawer sides	$\frac{1}{2}$ "	5"	10 $\frac{1}{2}$ "	Pine	14
1	" Back	$\frac{1}{2}$ "	4"	2'-6 $\frac{1}{2}$ "	"	15
1	" Bottom	$\frac{3}{8}$ "	10 $\frac{1}{2}$ "	2'-6 $\frac{1}{2}$ "	"	16
4	Styles for back	$\frac{7}{8}$ "	2 $\frac{1}{2}$ "	3'-8"	"	17
3	Panel " "	$\frac{1}{2}$ "	7 $\frac{1}{2}$ "	3'-8"	"	18

Fig. 47.—Bill of Material, Showing Sizes of Various Pieces Required.

Bill of Materials

The first consideration will be the amount of lumber required. The best way to estimate this is to make out a bill of material showing the size of each individual piece. In a large job this

bill of material is always a necessity, but even in a small job, such as the one at present under consideration, the lumber may be ordered of a size that will work up more economically if a proper bill of material is made out beforehand.

In Fig. 47 is shown the method used by the writer. The sizes marked are the finished sizes of the pieces, and when cutting them allowance must be made for dressing up. The column

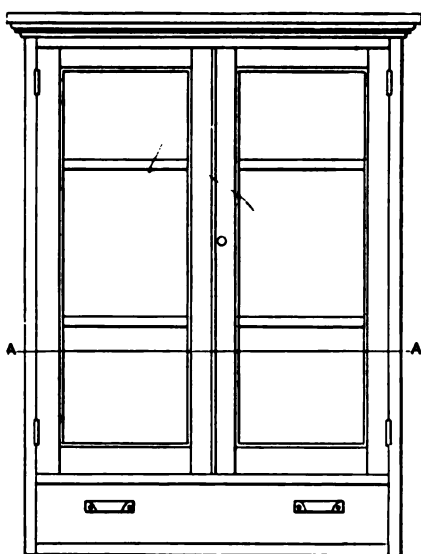


Fig. 48.—Front Elevation of Bookcase.
—Scale, $\frac{1}{4}$ In. to the Foot.

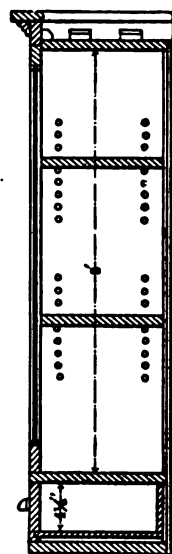


Fig. 49.—A Vertical Cross Section.
—Scale, $\frac{1}{4}$ In. to the Foot.

headed "Kind of wood" is generally omitted, as in most cases the second column indicates this sufficiently. The numbers in the last column are marked on the pieces with blue or red crayon as they are cut. They are chiefly useful in a job containing a large number of pieces or in connection with a job that may be laid to one side before it has been completed. In a case of this kind the workman might forget for what purpose a certain piece was intended, but a glance at the number on the piece and then at his list would at once tell him.

It does not take a very wise man to see the advantage of a list of this kind, for not only is he able to make a better estimate of the material required, but, being able by the list to cut up all of the material at once, he can select the best portions for the most important positions and can use up the small pieces to better advantage.

Methods of Construction

In Fig. 48 of the sketches is represented a front elevation of the bookcase which we shall consider. Fig. 49 represents a vertical cross section, while Fig. 50 is a horizontal section on the line A A of the elevation. The figures show quite clearly the construction of the article. The side pieces or ends are the full

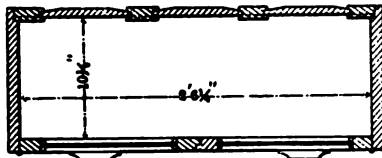


Fig. 50.—Horizontal Cross Section on Line A A of the Elevation.—Scale, $\frac{3}{4}$ In. to the Foot.

width of the case and extend the full height with the exception of the top member of the cornice. The bottom of the case is dovetailed into the sides. The shelf immediately over the drawer and the piece forming the top of the case against which the door shuts are gained or dadoed into the sides. The shelf is merely glued in position, while the top should be fastened with screws from the inside, and further strengthened by having small blocks glued in the angle formed between its upper surface and the sides of the bookcase.

The grooves to hold these pieces should not be cut through the full width of the sides, but be stopped back a short distance from the front edge, so that this edge may appear in an unbroken line from the bottom of the case to the molding of the cornice, as indicated in Fig. 48.

An idea of the manner in which the shelf is fitted is shown in Fig. 51, while the top being kept back $\frac{1}{4}$ in. from the front

does not require to be shouldered. The top rail of the case, that immediately above the doors, is shouldered back $\frac{1}{4}$ in., and grooves are cut in the sides of the case to the depth of $\frac{3}{8}$ in. for the reception of the small tenons thus formed. A couple of nails

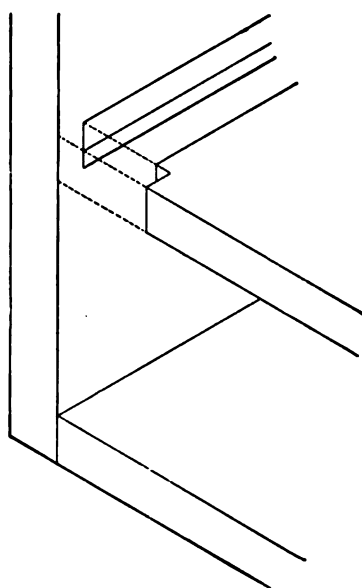


Fig. 51.—Showing the Manner in Which the Shelf is Fitted.—Scale, 3 In. to the Foot.

may be driven through the sides of the case into this rail, where they will be hidden by the molding of the cornice. Small blocks should also be glued in the angle formed between it and the top of the bookcase, care being taken to have the case perfectly square before any of these blocks are glued in place.

Fixing the Back

The back of the bookcase may be covered with $\frac{3}{8}$ -in. matched and beaded sheathing, but in some cases the construction shown is better. In it four uprights or stiles with grooved edges, and long enough to reach from top to bottom of the bookcase, are

properly spaced and nailed to the top and bottom boards, after which panels of $\frac{1}{2}$ -in. material are fitted in between them and have their centers nailed in the same manner. Note that the stiles are gained over the top and bottom boards and the shelf above the drawer as far as the front edge of the plow groove, thus allowing the panels to come close up and make everything dustproof. The molding for the cornice should be about $\frac{3}{4}$ x 1 in. or 1 x $1\frac{1}{4}$ in.—not larger—and it should be obtained at the commencement, as upon it depends the width of the top rail and, incidentally, the exact height of the bookcase.

The top rail is of such a width that the margin left after the molding is on is the same width as the edges of the sides of the bookcase—that is, $\frac{3}{4}$ in. The cap or top member of the cornice is merely a piece of square edged material, and it should, of course, be mitered in the same manner as the molding. If thought advisable a thin board may be fitted in the top of the bookcase flush with the upper surface of this cap, thus preventing an accumulation of dust and rubbish and forming, if carefully fitted up, a secret hiding place that might prove useful.

Adjustable Shelves

There are various styles of shelf supports that may be obtained for the adjustable shelves, but plain wooden pegs answer every requirement and are easier to secure. The holes for these pegs are $\frac{3}{8}$ in. in diameter and should be bored about $\frac{5}{8}$ in. deep with a perfect cutting bit before the case is put together.

Making the Doors

The fixing of the cornice completes the framework of the bookcase, and we will now turn our attention to the doors. As will be seen from an inspection of Fig. 50, these are rabbeted together where they meet in the center, and because of this the center stiles are made $\frac{3}{4}$ in. wider than the others. A $\frac{3}{4}$ -in. bead is worked on the meeting edge of the right-hand door, thus breaking up the wide surface that would otherwise be there, and making all the stiles appear of the same width. The stiles and top rails should then be about 2 in. wide, measured with the

bead that holds the glass, and the bottom rails $\frac{1}{2}$ in. wider. In the present example the beads are made separate and braded on, thus making stiles and top rails $1\frac{1}{4}$ in. wide and the bottom rails $2\frac{1}{4}$ in. These pieces should be cut from the straightest portions of the material and must be dressed perfectly flat and out of wind before any other work is done to them. This is very important, and if not attended to the doors will be "winding," and it will be impossible to make them fit properly.

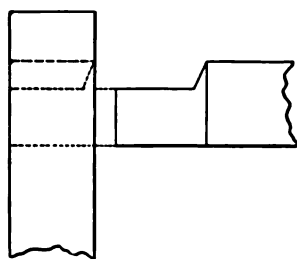


Fig. 52.—Detail of the Mortise and Tenon Joint Used in the Doors.—Scale, 3 in. to the Foot.



Fig. 53.—Beads for Holding the Glass in the Doors.—Scale, 6 in. to the Foot.

In Fig. 52 is shown a detail of the mortise and tenon joint used in the doors. It is not usually considered good cabinet work practice to cut the mortise right through, as shown, but, as the ends of the tenons do not show except when the doors are open and mortises are easier to make this way, also because this is the stronger method of the two, the writer advises its use in the present instance. Do not forget to leave the stiles an inch or two longer than the finished length or you will probably force out the ends of the mortise in the making of them.

Beads for Holding the Glass

The beads for holding the glass are made as follows: In a piece of board the same thickness as that used in the doors and a little longer than the glass measurement, work two beads as shown in Fig. 53—one on each side of the board. Mark two gauge lines down the center of the edge of this board about as far apart as the glass is thick. Rip the beads from the board as

shown by the dotted lines and plane out the saw marks; then divide the beads by ripping between the gauge lines and plane to the lines. The piece can be planed on the bench the first time, but after the second cutting the easiest way to work it is to fasten the plane, bottom up, in the bench vise, and dress up the beads by drawing them toward you over the plane iron. In fixing the beads put the outside one in first, keeping it just flush with the surface of the door; the inside one can be braded in after the glass is in place, and if it is not quite flush it will not matter so much.

Nailing Beads Without Splitting

If, when fastening these beads, it is found that the heads of the brads split them, drive the brads only part way in and then cut off their heads with a pair of cutting nippers and finish the driving. If the points of the brads split the wood cut them off before entering them, for the cutting makes the brads chisel-pointed and it will be found that they may now be driven into the most brittle material with absolute safety. The foregoing is a scheme that should be found useful to the carpenter in many places.

Locating and Fitting Hinges

The hinges are fixed to the doors in line with the edges of the rail, as shown in the front elevation. They should be very carefully fitted. The easiest way to hang the doors is to turn the case on its side and lay the door flat on the bench. In cases where the article cannot be laid on its side the easiest way is to fit the hinges to the case and secure them with one screw; then take them off and apply them to the doors. When it comes to hanging the door the screws can be easily run back into their original holes with one hand, after which there will be no further trouble, as the carpenter will have both hands for placing the remaining screws.

The left-hand door is fastened on the inside at the bottom with a small flush bolt. The right-hand door is fastened with a flat-keyed brass cupboard lock.

Facing Shelves with Oak

The two shelves for the inside of the bookcase may be made of oak throughout or of pine or basswood faced with oak. In the latter case the best way to glue the oak to the soft wood is to dress up the piece of oak twice the width of the facing it is intended to use and glue one of the pine shelves on each side of it. After the glue is dry rip the oak down the middle and dress up, thus making both shelves with one gluing and with one set of cramps. Only those who have attempted to glue a very narrow and a wide piece of board together will see the full advantage of this method.

In making the drawer for the bottom of the case, the front—which should, if possible, be the best figured piece of wood in the whole article—is made first and carefully fitted to the opening it is to occupy. After this has been done the drawer can be made according to the instructions in the chapter headed “Making a Cash Till.” The drawer pulls, if of metal, should be fixed in place and then removed until the article has been filled and polished.

Polishing the Bookcase

This completes the woodworker’s part of our bookcase, and though the writer could give instructions for the filling and polishing, it is quite a job for a novice, and, supposing the maker has no painter friend who will do it for him, he had better take it to a competent man, pay his price and have it finished properly. There is not anything more exasperating than to spend time making a good piece of woodwork and then have it botched up with a coat of gummy varnish, that will only dry after it has been covered with dust and has received the finger prints of every member of the family.

Before closing the subject it will probably be better to point out that the bookcase as here shown will only hold two rows of volumes as large as *The Building Age*, the upper space being left for books of a smaller size. If it is wanted to hold three rows it should be made 4 in. higher and an inch or so wider to keep the proportion about the same.

Objection has been made to keeping books behind glass doors, as this gives the impression that they are more for show than for use. In a room devoted entirely to library or study purposes open shelving is all right, but there are a number of us who do not possess this room, and then, again, we may have little brothers and sisters or little sons and daughters, or perhaps our place of dwelling is a boarding-house, in any or all of which cases the books will be all the better for being kept behind glass doors. Even suppose we admit the crime that the books are for show, will some one please tell the writer what looks more ornamental than a row of nicely bound, well-kept books?

CHAPTER VI

GENERAL REPAIRS

WE will now discuss some of the minor items that fall to the lot of the jobbing carpenter, and to that end will assume that he has been sent to make general repairs to a block of buildings, his orders being to fix up everything and leave them in good shape. Probably the best thing on which to commence will be the doors. The buildings may be new, in which case the doors may have swelled from dampness until they will not shut; or, if the buildings are old ones, the doors may have shrunk so that they leave the rooms very draughty. Perhaps, too, it may be impossible to shut the doors on account of the settling of the building.

Method of Re-fitting Doors

It has come under the writer's notice that there are many men who do not go at the refitting of a door in the proper manner. Some of the methods he has seen employed are hardly creditable to any one of average intelligence. For instance, some men will plane away at the top and bottom of the striking edge of the door, appearing to trust to luck and hoping that the portion where the lock is will shrink back of its own accord. Some will endeavor to coax the lock back out of the way of the plane with a few sturdy blows from a nail hammer. Others he has seen plane the clearance from the top and bottom of the edge of the door and then remove the striking plate from the door jamb and give the necessary clearance there with a rabbet plane. Still others would remove the lock, refit the door, and then make the best job they could of getting the lock back into place again.

The method of the writer is to remove the butts, give the clearance from the back edge of the door and then refit the butts. In many cases it will be found that refitting the butts is all that is

necessary, as some of the larger ones will sag open after they have been up a while far enough to make the door bind.

In double hung entrance doors, where they have a molding at their meeting edge, as shown in the cross section, Fig. 54, it is sometimes easier to remove the molding and give the door clearance from behind it, but this will depend upon how the molding is fixed to the door. Where it is properly fastened with screws the door can be refitted and no marks left to show what has been done to it.

The writer once refitted a pair of entrance doors in a public building in this manner. The building was new and the doors were of thoroughly kiln-dried ash. The weather being damp, it so happened that the doors soon swelled up again until they were as bad as ever. The proprietor of the building called up the "boss" and declared by all that was good and great the doors had never been touched because "he was out there yesterday and



Fig. 54.—Section of a Pair of Double Hung Doors, with a Molding at Their Meeting Edges.

the doors were worse than ever, and there wasn't a sign of anything having been taken off them." He was quite honest in his convictions and had to be shown how it was done before he would believe it.

The foregoing is mentioned simply because it illustrated the fact that a careful mechanic does not always get all the credit due him, because of his repair work being finished up in such a manner that it is noticeable only to the experienced eye. If some men had been at the refitting of those doors there would not have been much doubt as to whether or not anything had been taken off them.

When refitting the doors of old buildings that have settled, the jambs are generally out of square, and it is often necessary to piece out the doors to make them fit. Most workmen make the patch or filling piece the same shape as the space between the

door and the door jamb; that is to say, wedge shape, tapering from $\frac{3}{8}$ in. to nothing. This shape of filler is difficult to make and next to impossible to properly fasten unless it is glued in place and fitted after the glue is dry. Even then the thin feather edge is liable to get broken off. The proper method is to scribe and cut a small portion off the door so that the piece to be applied will be parallel in thickness. An inspection of Fig. 55 will

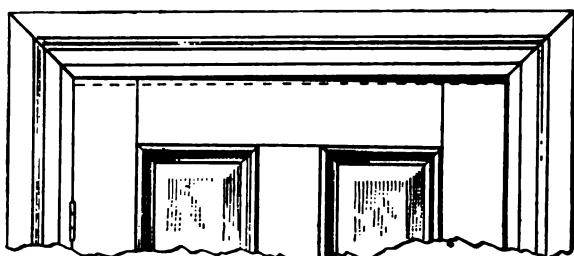


Fig. 55.—Head of Door with Jamb Out of Square.—Dotted Line Shows How Door Should be Cut so as to Have Filling Piece of Parallel Thickness.

make this clear. Indeed, the space between the door and the door jamb is somewhat exaggerated in order to make things plainer, and the dotted line shows how the door is cut so as to have the filling piece the same thickness throughout. In other cases it is better to move the butts a trifle, fit the top of the door to the jamb and then piece out with a parallel strip, firmly fastened to the door at the bottom, especially if there is a space at both top and bottom of the door. A little thick white lead paint is better than glue for applying to the joints in work of this character.

Trouble with Sliding Doors

Among the meanest jobs that fall to the lot of the carpenter, the refixing or fitting of sliding doors must be given a foremost place. They are one of the things that are easy enough to fix at the beginning, but after the house is built and the doors have been up for some time, to go and correct mistakes that have been made in the setting of them is a job in which a man has to expect about as much from good luck as from his own abilities. What

is wrong with the doors may be any one of a dozen different things, arising from as many causes, and it is hardly possible to give anything but a little general information on the subject of setting them right again. Anything wrong with the jambs or stops or any of the exterior portions of the woodwork can, of course, be easily seen and in most cases as easily rectified, but usually the trouble will be back in the wall, where it is hard to see and harder yet to reach.

Though the trouble may arise from different causes it nearly always amounts to the same thing, which is that the door sags or binds somewhere back in the wall. The remedy is to take down the doors, reach back into the wall with a long-handled chisel and give them clearance where necessary. If a good sharp heavy chisel is used it can be worked without the aid of a mallet. The greatest difficulty and annoyance is the lack of light. An electric light bulb on the end of a stick is a good thing, though a well-protected lighted candle is better than nothing. The candle can be fastened securely to a narrow strip of board and placed back in the wall where it will do the most good. Unless the light is protected with a wire screen great care must be exercised in its use or there will be some danger of starting a fire with the contrivance.

Removing Base and Other Moldings

In some cases of the old-style doors that are fitted with floor guides the base on one side of the double partition that forms the wall pocket is made removable, so that if anything goes wrong with the guide back in the wall the base may be removed and access had to the seat of the trouble. Sometimes these removable baseboards by reason of the screws being countersunk and puttied over are more difficult to remove than if the baseboards had been nailed in the usual manner.

It often falls to the lot of the carpenter when making alterations to be obliged to temporarily remove moldings and other woodwork, and some men if left to themselves make rather a poor job of it. Most of them can get the molding off without damaging it, but the trouble arises when attempting to replace it. Nine

out of ten of them will drive the old nails out and splinter the face of the work so badly that it can never be made good again. It is impossible to back out nails that have been puttied in without seriously marring the face of the woodwork, and as quite often happens the only reason for using the old woodwork is to save the painter a job, some other method must be found for removing them. If they are ordinary wire finishing nails with small heads they may be pulled right through the board with a pair of pincers or pliers. If they have large heads which prevent them being pulled through in this manner, nick each side of them close to the surface of the board with the edge of a half round file and a tap sideways with the file will break them off. This is, of course, a very simple matter, but it is one of the many small things that show the difference between the good mechanic and the "duffer."

Before leaving the subject of doors it will perhaps be well to say a few words upon the theme of door hardware. It has been mentioned elsewhere in this work that the old-time locks were as a general thing much larger than those in use at the present day, and that to replace an old lock with a new one was sometimes rather a problem. To avoid this the writer has, when the occasion warranted it, taken a new lock to pieces and used the springs or other parts of it to repair the old lock. Where the old lock is past all repair the best plan is to fill all the holes in the door with pieces of wood carefully fitted in and glued, and then when the glue is dry the door can be treated as if there had never been any holes in it.

Lock Trouble

Much lock trouble in new work is often caused by the painter running a brush full of varnish down the edge of the door right across the face of the lock. The varnish gets on the spring bolt of the lock and is hardly noticeable, but when it dries a little and gets "tacky" if the bolt is turned back into the lock it sticks there and some one noticing it finds fault with the man who put on the lock for not properly doing his work. Once the cause of the trouble is known it is easily removed. The varnish can be

scraped from the bolt with a knife blade and a few drops of oil renders everything as it should be.

Opening Door with Key Broken in Lock

A nice little job for the carpenter is to open a locked door fitted with a mortise lock in which there is a piece of broken key. If the door is hung with loose pin butts it is sometimes possible to take out the pins and open the door from the hinge side. This, however, does not often happen, for unless there is a lot of play in the door the thick portion of the butts will prevent it opening. The only thing then to do is to make a wide wedge of soft wood and drive it in between the striking edge of the door and the door jamb close to the lock bolt until door and jamb are separated far enough to release the bolt from the striking plate. If the door is properly fitted it may take two or even three wedges to do the job properly. The reason for using wide wedges of soft wood is to prevent them marking the door.

There are some pieces of door hardware for which it is necessary to have the maker's instructions before they can be correctly applied. Among these mention may be made of the cylinder night latches and the various makes of combined door checks and springs. The cylinder night latches are not as rare to-day as they were some twelve or fifteen years ago, and almost any of our present-day mechanics could put any of them on without the printed instructions. The more general mistakes made by the inexperienced in applying them are to bore the hole for the cylinder too small and sometimes to put the cylinder on upside down. This latter mistake has been made even when the instructions were at hand and the edge of the cylinder marked "this side down."

Opening Night Latch with Cord

In all of the better class of night latches the bolt is moved by turning the knob instead of sliding it back as was formerly the case. This makes it a little awkward whenever it is necessary to open the lock with a cord or chain from a distance. One way of overcoming the difficulty is to rivet a small strip of metal to the

face of the knob, thus forming a lever to which a cord may be attached, as shown in Fig. 56. A cheaper way and almost as good is to take the cord and after tying it to the knob wind it

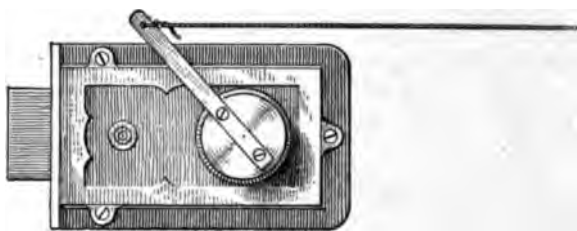


Fig. 56.—Showing Night Latch with Small Lever Riveted to Knob for Purpose of Opening Door with a Cord from a Distance.

around the stem of it until there is sufficient leverage to draw the knob back. Be sure and wind the cord in the right direction, and if a little cobbler's wax or even liquid glue is applied it will make it grip the knob stem better.

•

Door Checks and Springs

Door checks and springs as a general thing require careful measurements and fixing, and if one should happen to have the article without the directions for applying it he will in most instances save time by looking up some good hardware store and asking permission to see an instruction paper from the box of one of the door checks they have in stock. It is a good idea for the jobbing carpenter to have a collection of these instruction papers covering all the various kinds of hardware that he is likely to be called upon to fix or apply. They are easily obtained, for the manufacturers' supplying the articles are just as interested in having their goods properly applied as is the carpenter, and a request for one of these papers accompanied by the reasons for wanting it, together with a stamped and addressed envelope, will usually bring results by return mail.

Trouble with a Pivoted Door

To close this article upon the subject of doors and door hardware, the writer would like to mention an instance that once

happened to him and came near getting him into serious trouble. He had been sent for to fix one of a pair of large swinging entrance doors in a restaurant. The proprietor said "it just wants a little easing at the bottom."

The door was of oak 3 in. thick, 3 ft. wide and 10 ft. in height. It had a large fancy shaped beveled edge plate glass in it, and was covered with heavy carvings, some of which projected from the surface of the door a full 8 in. Altogether the door must have weighed close to 500 lbs. When the writer arrived on the scene the door was standing open at a right angle, with the outer lower corner resting on the floor. The writer took hold of it carelessly and tried to pull it shut, when without any warning the whole mass started to fall over on top of him. He does not know to this day how he managed to catch it and push it into a perpendicular position again, but he does know that he felt the

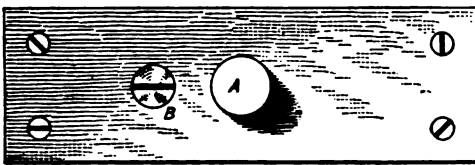


Fig. 57.

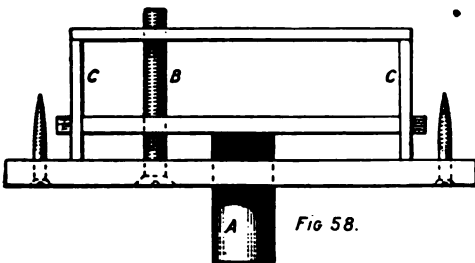


Fig 58.

Figs. 57 and 58.—Plan and Section of Pivot Plate with Pivot Down.

effects of the exertion for months afterward. What was subsequently found to be wrong with the door was this: The door was hung on pivots at top and bottom, the lower pivot being connected to a large cast iron weight in a cavity beneath the

floor. This weight was for the purpose of swinging the door shut, taking the place of a door spring. The upper pivot is shown in Figs. 57 and 58, the former being a plan view and the latter a longitudinal section. After the writer had set the door up again, and borrowed a waiter to hold it, he mounted a step-ladder to see what had gone wrong with the upper pivot. The first impression was that it had broken off, for the pivot plate showed a level surface and there was no sign of a pivot on it. A glance at Fig. 59 will make clear to the reader what had really happened. The pivot plate was adjustable and by turning the screw B the pivot could be moved either up or down. In some un-

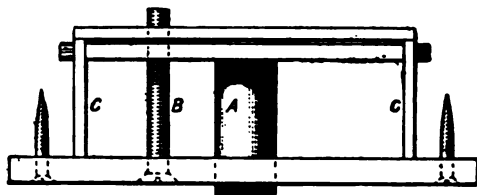


Fig. 59.—Pivot Plate with Pivot Raised.

accountable manner it had worked back until it was in the position shown in Fig. 59, and, of course, had allowed the door to drop over until the outer corner rested on the floor. It may be stated that the floor was of tile, and as there was no threshold the door had very little clearance. That it should have dropped off in the only position where it could possibly have remained upright was something of a miracle, but it seemed more of a miracle to me that I had been able to get this far with the job without doing about \$50 worth of damage. I learned afterward that the two doors with the frame and fanlight had cost in the neighborhood of \$500.

In the illustrations, A is the pivot, B the adjusting screw, and C C the guides. I had never seen anything like this before, and, of course, all the mechanism was hidden in the woodwork until I started to take it off. I commenced at the screw B, it being the largest, and was surprised to see the pivot come down into its place again. I was never able to account for the pivot working

up out of the door. At first thought it seemed as if some one else must have been at the job ahead of me—a not uncommon occurrence—but when this was suggested to the proprietor he gave it a most emphatic denial, and as that was absolutely all that was wrong with the door I had to believe him, for the job was childishly simple once it was discovered that the pivot would move.

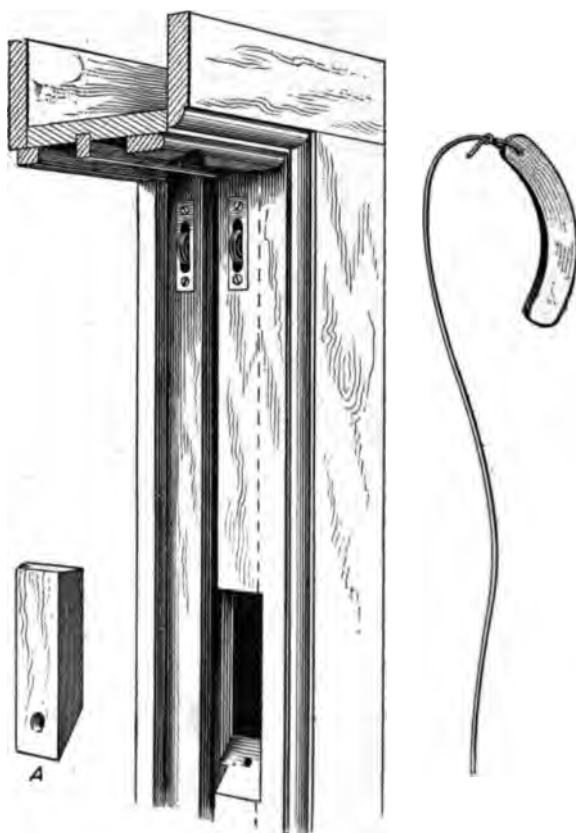
Replacing Broken Sash Cord

After having made all necessary repairs to the doors of the building as described in some of the earlier pages, the next thing is to examine the windows. One of the chief repairs to these is the replacing of a broken sash cord. To the mechanic of experience this is a simple job, but to the novice it is likely to present no little difficulty. Replacing a broken cord is sometimes more of a job than hanging new sash, although any person who has done one will not find any difficulty in doing the other. The cords of the outside sash are the hardest to replace because of the inside sash being in the way. If the sashes are large and heavy it is usually better to take the weights off the inner sash and remove it entirely out of the way. Indeed, in most cases this is the proper thing to do, because all of the cords of the window will be more or less worn and the difference in cost between replacing a cord in the outer sash and the replacing of all four cords is hardly anything more than the price of a few feet of sash cord.

Purpose of the Weight Pocket

In the experience of the writer, he has found men who called themselves carpenters and yet who did not know for what purpose the pocket was cut in the pulley stiles of the window frames. They had been in the habit of putting in the weights and cords before the window boxes were covered up, and when set to work to hang some sash for which the weights had not arrived until the job was completed they commenced to tear off the casings in order to get at the weight boxes. This seems hardly credible, but it is a fact, nevertheless.

When the window frames are so made that the inside casing forms one side of the weight box, it is much easier and quicker in new work to put in the weights and cords before the casings are fixed. In repair work the casings are already on, and it



Figs. 60 and 61.—Views of Pulley Stile of Window Frame and "Mouse" for Passing Cord Over the Pulleys.

then becomes necessary to hang the sash by passing the weights through the pockets provided for that purpose. The first thing we must do is to take off the inside stops and take out the parting bead so as to get at them. Very often the beads and stops

are stuck fast with paint and require great care in their removal. A few sharp taps with a hammer and block of wood will often break the joint formed by the paint, the block of wood being, of course, used under the hammer to prevent it marring the woodwork. With the beads, stops and pocket piece removed we can now reach into the weight box and remove the weight. Fig. 60 represents a view of the pulley stile as it now appears, "A" being the pocket piece.

The Carpenter's Mouse

For passing the cords over the pulleys and down inside the weight box a small homemade affair called a "mouse" and shown in Fig. 61 is used. It is simply a curved strip of lead about 3 in. long and $\frac{3}{8}$ in. wide to which is attached a piece of twine or string long enough to reach from the top to the bottom of the window. The free end of the string is fastened to the end of the sash cord and the "mouse" is passed over the pulley and allowed to fall inside the box. It is then brought out through the pocket and the sash cord drawn after it. The weight is now fastened to the cord and replaced inside the box, after which it is drawn up until it will go no further, when the cord is cut to the proper length, which will be just so as to allow of the sash resting on the window sill after the cord is fastened to it. With the sash in this position there should not be more than an inch or at most 2 in. of slack in the sash cord. To have more than this is considered poor workmanship.

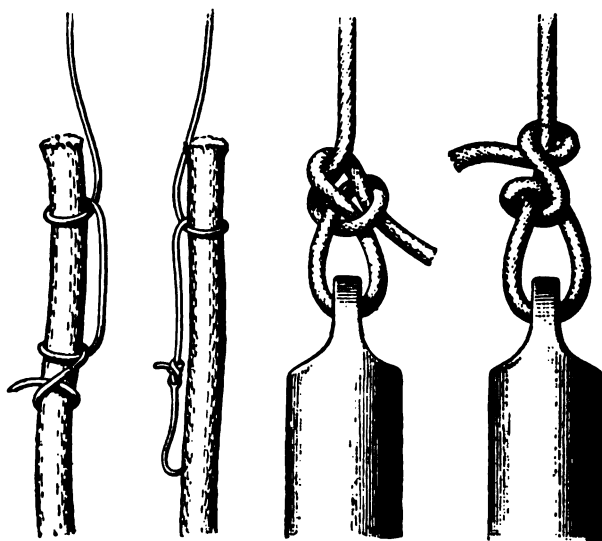
Threading the Pulleys

When all four cords are to be replaced the best practice is to thread all the pulleys before removing the "mouse" from the sash cord, which saves a little time in the tying and untying, and is generally considered more workmanlike. When using this method thread the outside pulleys first, and then the inside ones, taking the cord across the window each time, otherwise the workman is likely to get tangled and waste a lot more time than he would expect to save. With the pulleys all threaded tie a weight to the end of the cord, pull it up tight, measure and cut off.

Tie a knot in the end of this cord to prevent the weight taking it back into the box again, and then go on with the others. A better scheme than tying a knot in the cord is to pull the weight up where it belongs and drive a 3-d. nail through the cord into the pulley stile. This holds the weight in its place and leaves the workman with both hands free when he goes to fasten the other end of the cord to the sash. The cord should be fastened before it is cut to length, then if the weights are heavy they can be held in place by standing on the cord, which again leaves the workman with both hands free for the hammer and nail.

Attaching Mouse to Sash Cord

Braided sash cord being hard and smooth it is sometimes rather difficult to make the string fast to it. In Fig. 62 is shown



Figs. 62 and 63.—Methods of Attaching "Mouse" to Cord.

Figs. 64 and 65.—Knots for Fastening Cord to Sash Weights.

one method of doing this. The string is fastened with a clove hitch a couple of inches from the end of the cord and then a half hitch is put on close to the end to make it lead straight. In

Fig. 63 is shown a better and quicker method. In it the end of the string is supplied with a small hook which is pressed into the sash cord, then a half hitch placed as shown makes everything secure.

This latter method is original with the writer so far as he knows, and was hit upon quite by accident. While hunting one day for a piece of twine with which to make a "mouse," a small fish line was unearthed. He was about to discard the hook from the end of the line when it suddenly occurred to him that the hook was the very thing needed. It was necessary to file the barb from the hook so as to make it easy of removal, and then all the old trouble of the twine or string slipping off the cord was forever ended.

Fastening Cord to Weight

There are different ways of fastening the cord to the sash weights, some people preferring the bowline knot shown in Fig. 64, while others like a knot that can be slipped down close to the weight after it is tied. For these the knot composed of two half hitches, as shown in Fig. 65, is everything desirable.

Fastening Cord to Sash

For fastening the cord to the sash when the latter are properly bored for the purpose a simple overhand or round knot will suffice. The writer, however, has been in the habit of making things doubly sure by driving a small nail in the end of the cord after the knot is tied and in its place. This is quite clearly indicated in Fig. 66. In those cases where the sash are simply grooved and it is necessary to fasten the cord entirely with nails, care must be observed to keep the nails far enough down so that they will not interfere with the pulleys.

Size of Sash Weights

Sash weights are obtained in sizes from 3 to 9 lbs., varying by $\frac{1}{2}$ lb. and from 9 to 26 lbs. varying by pounds. Half pound weights can also be had, the latter being merely cylindrical pieces of cast iron about 2 in. in diameter and $\frac{3}{4}$ in. high, with a hole

through them vertically for the passage of the sash cord. They are useful for making an exact balance, or in cases of low heavy windows in which we are not able to cut the pockets



Fig. 66.—One Method of Fastening Cord to the Sash.

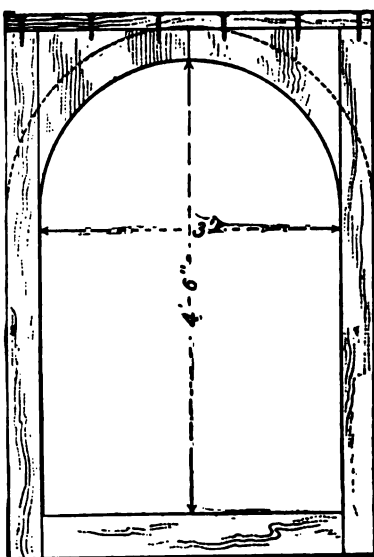


Fig. 67.—Ticket Window to be Repaired.

high enough to take in the weights. Two inches in diameter is about as large as a sash weight can be made and all extra weight must be added lengthwise. This makes a 24-lb. weight about the length of a walking stick, and the thing to do where weights as heavy as this are needed is to get a weight as large as the pocket will take and make up the balance with the $\frac{1}{2}$ -lb. weights, which may, if necessary, be placed in the weight box one at a time. Sometimes for cases like the foregoing instead of the ordinary cylindrical cast iron weights, lead weights of a square section are used, but their cost prohibits their general adoption.

If it ever becomes necessary to use up some weights that are too heavy for the purpose do not make the mistake of trying to

cut them with hammer and cold chisel. It is easy to break them wherever required by striking them over the corner of some heavy article, such as a blacksmith's anvil. In the absence of anything better they are often broken by striking one weight over another. Great care is required in breaking weights that are more than 18 or 20 in. long, as these are liable to break in three pieces, about as much snapping off behind where the weight is held in the hand as breaks off in front.

Some Problems in Replacing Sash Cord

Window frames are sometimes made which allow of both sashes running clear up into the head, thus leaving the entire window space open. They are used in place of a door or French casements, and generally form a mode of egress on to an upper balcony. It is, of course, necessary to make these frames half as high again as an ordinary window, but as the upper portion is hidden in the wall and inaccessible once the frame is set and the building plastered, the pulleys in these frames should be located at the point where the sashes run up into the window head.

The writer once had to replace some cords in a window of the above description, and found that the genius who constructed it had put the pulleys close up to the top head of the frame which made them about 3 ft. out of reach. He at first considered the advisability of putting in new pulleys at their proper places, but finally managed to pass the "mouse" over those already in by the help of a short stick to which was attached a piece of lighted taper. The "mouse" was balanced on the end of the stick, and at the first trial the light burned the string off it. This merely made necessary the readjustment of the apparatus, after which all four pulleys were threaded without a hitch. It is hardly necessary to mention that the light is needed to enable one to see what he is doing.

Some time after this little problem had been solved it became necessary to make repairs to a ticket window in a public building. The window had only one sash, which was 3 ft. wide and 4 ft. 6 in. high. It had a semicircular head and was glazed with

plate glass. Like the other one, it ran up into the wall, and nobody at the time of its construction had thought of making provision for any repairs to it. Remembering the success with the former job, this one was commenced with all confidence. The confidence, however, did not last long, for it was soon found that although the sash was made to show semicircular outside, inside in the wall it was rectangular, being, in fact, made as shown in Fig. 67, which, of course, would prevent its being taken out of its frame. The strip shown across the top of the sash was fixed to it with glue and a few nails. This was discovered by the writer

soon after he commenced to cut the sash around on the dotted line with his compass saw. After the sash was finally removed the trouble was found to be a broken pulley. So as the window was only required to open as far as the springing of the circle, two new pulleys were inserted as high up on the frame as it was possible to reach, and then the sides of the sash were re-plowed and the cords fastened to it at the bottom. It was then necessary to use square lead weights the full size of the weight box in order to get drop enough.

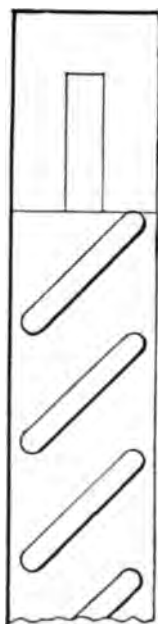


Fig. 68.—Showing Mortises for Stationary Slats.

Repairing Outside Blinds

Outside blinds are often in need of repairs; and though those with rolling slats present difficulties enough, the old-fashioned kind with the stationary slats are even worse. The writer used to find it such a mean job to cut the small round-end mortises, shown in Fig. 68, with a chisel that he finally secured one of the tools made for this purpose that is part of the equipment of the most of the foot-power mortising machines. Fitted with a stout wooden handle it could be used with a mallet almost as well as in the machine.

Blinds with rolling slats usually give out either at the pins of the slats or at the rod which controls the slats. In making new

slats the pins are cut square with saw and chisel and then may be quickly rounded with a rasp. In putting on new rods all the staples should be driven into the rod first, then, the blind being fixed so that the slats stand edgewise, with their lower edges resting on a bench or something similar, it is an easy matter to drive the staples through those in the rod into the upper edges of the slats.

Tearing Up Floors

Doors, windows and blinds provide most of the repair work that falls to the lot of the jobbing carpenter, the only other item running them close being floors. It is not the intention to say much upon this latter subject, as it is a class of work that ought not to present many difficulties. It may, however, be well to mention a mistake usually made when it becomes necessary to tear up an old floor before laying a new one. Most men when doing this start close to one of the walls. This is where they make the error, because until one gets two or three feet away from the wall he has no room in which to work and no chance to use his tools. The proper way is to tear up a board in the center and then work both ways from it.

Placing Wire Conduits Under Floors

Speaking of floors recalls a job that the writer once did and which may perhaps have some interest for the reader. A large room was being converted into a telegraph office, and it was especially desired that no wires of any kind should show in the room. The legs of the desks and tables were made hollow and all wires for electric lights, telegraph and telephone were to be brought along under the floor and up through the table legs. This would not have been difficult were it not for the fact that the floor was double, the upper one running at right angles to the one below, which in its turn ran at right angles with the floor joists. The ceiling below was plastered, and besides this the lower story was 20 ft. high, which made it impossible to do anything from below. The diagram, Fig. 69, will perhaps explain pretty clearly how the work was done. All the wires entered at

"A" through a cupboard under the counter. The dotted lines indicate the floor joists; the cross lines the joints of the under floor, and the vertical lines the joints of the upper floor. A good size hole was cut in the floor of the cupboard at "A" and a line was marked on top of the floor showing the direction of the wires. A careful measurement was then taken from "A" to the side of the first joist, and a line representing this joist was drawn on

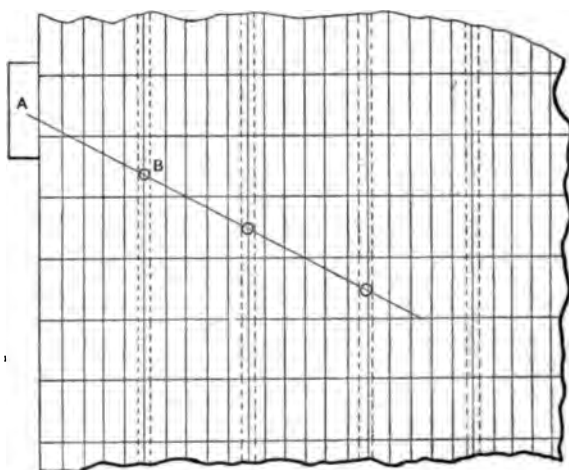


Fig. 69.—Method of Running Wires Under a Double Floor.

top of the floor parallel with the side of the room until it intersected the other line at B. A 2-in. hole was then bored through both floors and into the floor joist until there was sufficient room to pass the conduits that were to contain the wires. A 2-in. hole was made first so that we might be sure of hitting the joist before making the hole too large. It was afterward made square and enlarged to the width of one of the upper floor boards, or in cases where the hole came between two of these boards it was made as wide as both of them. After the hole at B was cut, measurements were again taken to the side of the next joist and the operation continued as before. After all the holes were cut a cord was drawn through with a "fish wire," which cord easily drew the conduits in after it.

On the diagram is shown only one line of wires but there were several more of them, some consisting of only one conduit, while others had three. The conduits were made of some insulating material and were about $\frac{3}{4}$ of an inch outside diameter. After the wires were all in, the holes were filled with neatly fitting pieces of flooring, and three days after the room was in use it would have taken sharp eyes to have seen where the pieces were.

CHAPTER VII

TAKING MEASUREMENTS

MOST of the items considered thus far have been one-man jobs, but frequently when the work is on a larger scale a man is sent out from the shop to obtain measurements and other data for such fixtures and pieces of woodwork as are needed to bring the job to completion. These fixtures may perhaps be made in the shop or procured outside, depending upon whether they are stock patterns and also upon how many pieces are needed. Whichever course is followed it will be necessary to get the size and pattern of them; therefore this chapter is written with the idea of affording some information regarding work of that kind.

The item of taking measurements is an important one, but after a number of years spent in the business not only in taking measurements himself, but also being responsible for the measurements and mistakes of others, the writer finds that about all the information he can offer on the subject is this: Keep your mind intently upon the matter in hand and make a careful, complete check of your figures as many times as may be necessary for you to be certain they are correct. The best teachers of all in this matter are the mistakes every one of us is liable to make, and it is quite probable that many mechanics do not grasp the importance of this simple subject until they have through carelessness made some serious mistake in measurement, which cost the boss time and money, and lowered their own percentage as able workmen. Some men without doubt fall into habits of carelessness in this matter because whatever they are working upon is close at hand and they can, if at all in doubt at any time, make a new measurement.

In the work we are at present considering, however, a second measurement is out of the question, as the job is often a considerable distance from the shop and may sometimes indeed mean a long railroad journey. But as a general thing, before a

man will be trusted with work of this class he must have proven his ability for it, so that these few remarks should be merely considered as caution signals for the younger members of the craft who have not as yet attained that position.

Left-handed Rules

Although most of our American rules are made left handed or upside down, it is only the novice who is liable to make a mistake by reason of this, the finished workman seldom reading the figures. He calculates the measurements mentally from the joints of his rule and knows, for instance, that the second mark beyond the center joint is 14 in., though the figures on his rule read 10. This is one reason why it is easier for most people to measure with a rule than with a steel square, the joints in the rule helping to locate the measurement. Indeed, for all practical purposes the numbers on a 2-ft. rule might as well be omitted altogether, the division marks being the only things that are looked for by the mechanic. This is proven by the fact that if a man who has used a 2-ft. rule for a considerable time commences to use a 3-ft. one he finds himself, at the start, continually taking the joints in his new rule for the distances represented by the joints of his old one.

Measuring with Two Rules

We have stated that a mechanic is not liable to make the mistake of taking the wrong figure on his rule, but there are other mistakes for him to make. Ask two different men to mark off with rule and pencil a distance of 20 ft. Will the two measurements match exactly and will either of them be exactly 20 ft.? There is a doubt about it. Try this little experiment; measure off with rule and pencil a distance of 20 or 25 ft. Then get an extra rule and go over the same measurement, not making marks, but laying one rule down and placing the second one against it; then lifting the first and placing it at the end of the second, and so on until you have again gone over the entire measurement. If you are not familiar with this little scheme the result at the end is liable to surprise you.

Minor Errors Repeated

Serious mistakes are sometimes made by reason of a minor error being constantly repeated. A slight mistake in the measurement of a 10-ft. pole will assume noticeable proportions when the pole is used for measuring the side of a large building.

Setting Out a Right Angle

Take the well-known method of setting out a right angle shown in Fig. 70, that is, 6 ft. on one side, 8 ft. on the other, and 10 ft.

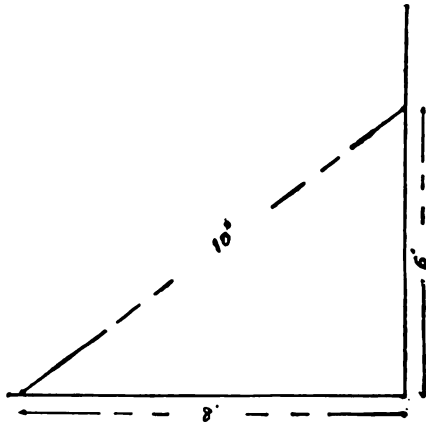


Fig. 70.—Method of Setting Out a Right Angle.

across. You will not get your structure square if there is the slightest inaccuracy in any of these measurements.

The moral of all this is: for long and accurate measurements use a tape. A guaranteed steel tape is the only one worth considering. There may be linen tapes that will hold their accuracy under all conditions, or that will not show a certain amount of elasticity, but thus far they have not come to the writer's knowledge. Besides, length for length the linen tapes are larger and clumsier than the steel ones.

Measuring With Tape

Measuring with a tape is simple enough and should not require any explanation, though cases have been known where the

figures on the tape were read upside down, 29 being taken for 26 and so on. The ring at the end of the tape is another source of error, and when in making measurements you call outside assistance to your aid, be sure it is understood that the end of the ring is the end of the tape, for there are many people who look upon the ring as being nothing but a handle. The tape can, of course, be used single-handed by fastening one end of it with a nail, or what is better yet, with a brad awl.

Wherever possible, it is a good idea to make the measurements and arithmetic check each other. For instance, supposing you are to lay off an opening 3 ft. $1\frac{1}{2}$ in. wide in the center of a recess 7 ft. 9 in. wide, the half of 7 ft. 9 in. will be 3 ft. $10\frac{1}{2}$ in.; measure 3 ft. $10\frac{1}{2}$ in. from each side of the recess and the two marks coming together will prove that you have the correct center.

Now the half of 3 ft. $1\frac{1}{2}$ in. is 1 ft. $6\frac{3}{4}$ in.; measure 1 ft. $6\frac{3}{4}$ in. from the center one way and from the point thus obtained measure 3 ft. $1\frac{1}{2}$ in. in the opposite direction. If this second mark measures 1 ft. $6\frac{3}{4}$ in. from the center one, both your measurements and your arithmetic are correct.

Measuring Without Arithmetic

It is best in all cases to do as little arithmetic as possible—make your measurements direct. To deduct $3\frac{5}{8}$ in. from 21 in., let the rule stand past the work $3\frac{5}{8}$ in. and mark at 21 in.; or, as another instance, supposing a railroad structure is to be erected 20 ft. from the center of the track. The distance between the rails (standard gauge) is 4 ft. $8\frac{1}{2}$ in. The half of 4 ft. $8\frac{1}{2}$ in. is 2 ft. $4\frac{1}{4}$ in. Hold the 2 ft. $4\frac{1}{4}$ in. mark of the tape to the inside edge of the nearest rail and the 20 ft. mark gives the location of the structure. Mention is made of this item because quite lately the writer saw a workman cut a piece of board in between the rails and make his measurement from the center of it. He has also known of others who deducted the 2 ft. $4\frac{1}{4}$ in. from 20 ft. and erected the building 17 ft. $7\frac{3}{4}$ in. from the nearest rail. Now all of these methods give the correct distance, but

the first one is easier and less liable to error than either of the others.

Molding Profiles and Room Angles

There are, of course, other items besides measurements to be considered, such, for example, as the profiles of brackets and moldings, the angles of various rooms, the shape of arched openings, etc.

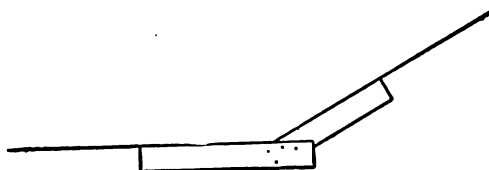


Fig. 71.—Pattern Showing Wall and Room Angle.

It is generally possible to obtain small pieces of the moldings to be used as samples, but failing which a thin piece of card can sometimes be inserted in one of the joints and on it the shape of the molding can be marked. The various wall and room angles

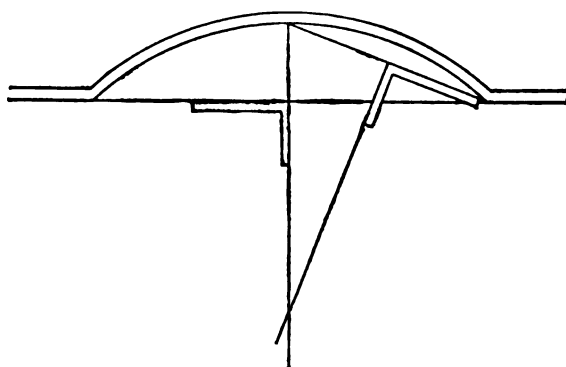


Fig. 72.—Device for Finding Radius of Any Segment of a Circle.

may be obtained with a bevel protractor or a permanent pattern can be made by nailing two strips of wood together at the proper angle as shown in Fig. 71.

Finding Radius of Segment

The radius of any segment of a circle can be found by the method illustrated in Fig. 72. This is not the most scientific method, but it is as accurate as any and is probably the most easily remembered. Knowing that some of the readers have an antipathy for the A B C's of geometry, I have left them out and endeavored to make the sketch understandable without them. The steel square is applied to the center of the line in each case.

Getting Pattern of Elliptical Space

To obtain the shape of an elliptical space or opening, proceed as illustrated in Fig. 73. All that is required is a piece of board a little longer than the opening is wide and a pointed lath. Place

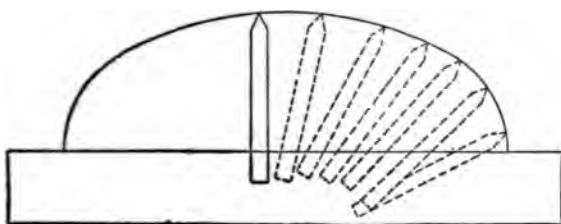
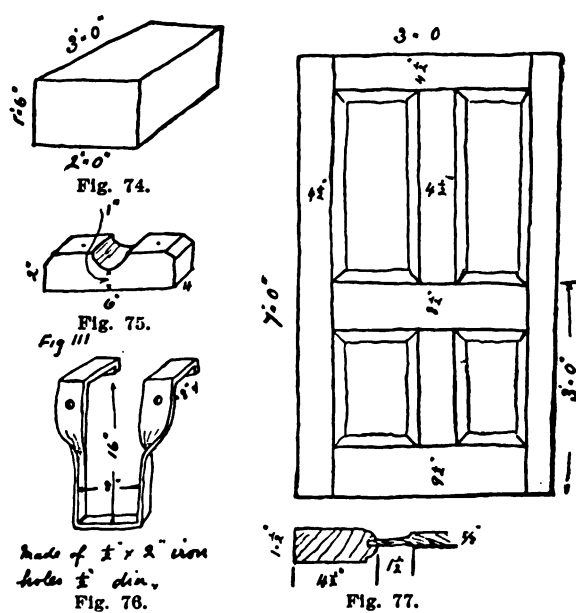


Fig. 73.—Method of Obtaining Shape of an Elliptical Space or Opening.

the board against the opening as shown in the sketch and apply the lath to as many and varied positions as possible, marking on the board along one side and end of the lath. The lath is shown in position in the sketch and the various points already taken are indicated by the dotted lines. After the lath has been applied all around the curve, remove the board and place it in the same relative position against the board that is to be used as a pattern. If we now apply the lath to the marks on the board and prick off each time the position of the point of it we will obtain a series of dots or marks through which the original curve may be drawn. This is a good scheme to know about, for by means of it one can get the shape of any space that is not too large, no matter whether it be curved or angular, regular or irregular.

Making Rough Sketches

An important consideration in work such as that under discussion is the matter of making rough freehand sketches of the work in hand. It has been said that "drawing is not only a universal language, but the shortest of all shorthands." There is truth in the statement, and for a man to obtain any proficiency as a mechanic it is necessary that he have some small knowledge of this important subject. This does not mean that he must be a finished draftsman, but he certainly ought to be able to make such rough sketches of common objects as will enable him to record their shape and size in a smaller space than would otherwise be the case.



Figs. 74-77.—Direct Reproduction of the Author's Sketches.

Having a good idea of his own limitations, the writer does not for a moment presume to set himself up as a teacher of drawing, but he has asked of our worthy editor (as a special indulgence)

that the sketches Figs. 74 and 77, inclusive, be reproduced exactly as they were drawn in order that the readers may see how rough a sketch may be and still answer its purpose. Fig. 74 shows the fundamental principle. It may be made to represent almost anything that has square corners, from a brick to a tool chest or kitchen table. Stand it on end and it becomes a cupboard or wardrobe. Almost any one can draw a figure of this kind and it should take but little practice to enable him to fill in the detail and change the block into a box, table or cupboard, as the case may be, which makes it possible for him to show all the several measurements of an article in one sketch.

Figs. 75, 76 and 77 are copied at random from one of the writer's old note books. Fig. 75 has a special significance, because it is the sketch which first started him making sketches of his own. Years ago when he was a "cub carpenter" he was employed upon the construction of a large manufacturing building. One day the superintendent paused in passing; picked up the cub's level, drew the original of Fig. 75 on one side of it, and, handing the level back, he said: "That is a support for 2-in. pipe, I want fifty of them; make them out of rough 2 x 4 in., and was gone. The whole incident did not take more than a minute and the cub said to himself: "Gee! I wish I could do that."

Fig. 76 is a sketch of a beam hanger or stirrup, and if to the novice it appears a little difficult he has only to remember that the shape of it is contained in the sides of the block shown in Fig. 74. It would have taken three sketches to have shown all the dimensions of this article by any other method, and even then it is doubtful if the idea would have been as clear.

Fig. 77 is the sketch of a door that had to be made to match the balance of those in the building, and regarding it we expect to have more to say later.

Keep a Note Book

Mention of the fact that these sketches were copied from one of the writer's note books affords opportunity to remark that it is much better to have a note book for keeping a record of these

The "Setting Out" Rod

In all work of this kind the first consideration should be the making of a "setting-out" rod from which the exact size of each piece of material contained in the door may be obtained. This



Fig. 79.—Horizontal Cross Section Through Stile of Door, Taken on Line A-A of Fig. 78.

rod should be about 3 in. longer than the door, as wide as the door is thick, and from $\frac{3}{8}$ to $\frac{1}{2}$ of an inch in thickness. This latter measurement is not important and quite often a waste strip of wood, wherewith to make the rod, may be obtained from the plank from which the stiles and rails of the door are cut. On one side of the rod a full-size vertical section of the door is drawn, and on the other a horizontal section, as shown in Fig. 80.

In marking out the rod, first set out the full height of the door, then the widths of the bottom and top rails. Then at the correct distance mark the top edge of the middle or lock rail and set off the width of it, getting all your measurements from Fig. 78. Now from the inside edges of the top and bottom rails and from both edges of the lock-rail, set off a distance of $\frac{3}{8}$ in., which is the depth of the plow-groove that is to receive the panels, and divide up the balance of the space for mortises. The bottom rail and lock rail have double tenons, the top rail having a single tenon.

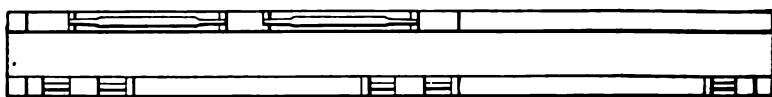


Fig. 80.—A "Setting-Out" Rod for Use in Obtaining the Sizes of the Material Contained in the Door.

To prevent the mortises splitting out there should be a distance of at least $1\frac{1}{2}$ in. between the ends of them and the ends of the stiles, so we mark a line $1\frac{1}{2}$ in. from the top of the door and use

the space between this mark and the plow groove for the mortise of the top rail. Then we mark a line $1\frac{1}{2}$ in from the bottom of the door, divide the distance between this line and the plow groove into three, and use the two outside spaces for mortises. The space between the two plow grooves of the lock rail is also divided into three and the two outside divisions used for mortises.

Width of Mortise Chisel and Plow Groove

The thickness of the tenons should be approximately one-third the thickness of the door. The mortise chisel and the bit for the plow grooves should be of the same width, but if they are not the chisel must be wider, otherwise there will be a space between the sides of the tenons and the sides of the plow grooves, forming a weak spot in the door where it needs strength the most. Fig. 81 is a section showing how the joint would appear in a case where the mortise chisel was smaller than the plow bit.

Set the mortise gauge to the width of the chisel intended to be used, and with it mark parallel lines on the rod, representing the sides of the mortises and the fielded ends of the panels. If thought necessary these lines can be gone over with a pencil and the thicker portions of the panels drawn in.

It will not be necessary to explain the marking of the other side of the rod, but we will just mention that all the measurements made on the rod must be exactly correct because the various portions of the door are marked directly from it; also, the cross lines—those representing the ends of the mortises and the shoulders of the tenons—should for greater accuracy be marked with a knife edge.

The rod can now be used for marking the full lengths of the different pieces while they are still in the plank, which will save some pencil marks and may perhaps save some mistakes. Use the straightest portion of the plank for the stiles of the door and



Fig. 81.—Section Showing How Joint Would Appear in Case Mortise Chisel Used Is Smaller Than Plow Bit.

make them as long as the rod, so as to have at least $1\frac{1}{2}$ in. of spare wood at each end of the door. This extra wood is left on for two reasons; it prevents the ends of the stiles from getting a worn and battered appearance before the door is hung, and also strengthens them while cutting the mortises or driving the tenons into them. In many classes of small doors the rails are so narrow that to get any width of tenon at all the mortise must often come with $\frac{1}{2}$ in. of the end of the stile and it would be next to impossible to cut the mortises, or, having cut them, to drive the tenons into them without this extra length of stile. Mark the rails 1 in. longer than the finished size to allow for small chamfers on the ends of the tenons, and mark all of the pieces $\frac{1}{4}$ in. wider than the finished sizes to allow for sawing and planing.

Cut up all of the material before starting to dress it, and if the stuff for the panels is not wide enough to make them in one piece, they should be jointed and glued before anything else is done, so as to give the glue a chance to set while we are working on other portions of the door. The preparing of glue and making of glued joints having been already discussed, those needing information on that subject are referred to Chapter III.

Bill of Material

No. of Pieces	What For	Thickness	Width	Length
2	Stiles	$1\frac{1}{8}$ "	4"	7' $11\frac{1}{8}$ "
1	Muntins	$1\frac{1}{8}$ "	4"	3' 4"
1	"	$1\frac{1}{8}$ "	4"	1' 11"
1	Bottom Rail	$1\frac{1}{8}$ "	9"	3' 1"
1	Middle "	$1\frac{1}{8}$ "	8"	3' 1"
1	Top "	$1\frac{1}{8}$ "	4"	3' 1"
2	Panels	$\frac{3}{4}$ "	$12\frac{3}{4}$ "	1' $7\frac{3}{4}$ "
2	Panels	$\frac{3}{4}$ "	$12\frac{3}{4}$ "	3' $8\frac{3}{4}$ "

Fig. 82.—A Bill of Material.

It will perhaps be better for the novice to make out a bill of material as shown in Fig. 82. This does not take long, and although in so simple a job it may be thought hardly necessary, yet it is a pretty good habit to form, anyway.

With all of the material cut out, we next proceed to "dress it up," and the first part of this operation is to take the "face" side out of wind. This, though often neglected, is very important, for if there is any twist in any of the material, that twist will be exaggerated in the door when the various parts are assembled.

Taking Out of Wind

The old-time workman's "kit" always contained a pair of winding sticks, and although it is possible to "face up" material without their aid it will be better for the student to use them in his first attempts. They consist merely of two parallel strips of wood about 16 in. long, $2\frac{1}{2}$ in. wide, $\frac{3}{8}$ in. thick at their lower edges and a little less at their upper. They are simply made this way for convenience in handling, as any two pieces of material with parallel edges will answer the purpose. In the absence of anything better, a couple of bench planes laid on their side have often been used.

To use the winding sticks, place the material flat on the bench and set a winding stick on it at each end, sight across the tops of them and see if their upper edges coincide. If they do, the material is out of wind; if they do not, notice which ends of the sticks are highest and plane off those two corners of the material until the upper edges of the winding sticks, when again applied, are seen to be parallel or in one plane. Of course, the purpose of the winding sticks is to multiply the inaccuracy and make it more discernible, $\frac{1}{8}$ in. of wind in a piece of material $\frac{1}{4}$ in. wide showing up as $\frac{1}{2}$ in. on the winding sticks. When facing up long material, such as the stiles of the door, it is necessary to move one of the sticks to various positions, otherwise it is possible to get the ends of the material correct and yet have it winding in the center.

Face Marks

After the "wind" is taken out, straighten the surfaces lengthways and square-up one edge. This edge is always squared from the face side; that is, the side we have just taken out of wind,

after which distinguishing marks, called face marks, are made on this side and edge, as shown in Fig. 83, and the piece is gauged to the correct finished width. The rails and muntins are gauged to the sizes shown on the rod, but the stiles may, if chosen, be left with one edge rough to be dressed off when the door is being fitted to the jamb. Each piece of material is faced, squared, and gauged in this manner separately, and then it is all dressed to the gauge lines in one operation; of course, all pieces of the same width should be dressed in rotation to prevent constant altering of the gauge. In the days before mill-dressed

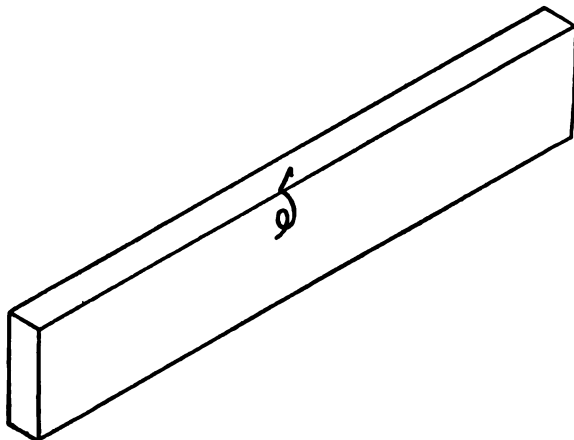


Fig. 83.—Showing "Face Mark" on Side and Edge of a Piece of Material.

lumber was so much in evidence the material had to be gauged and dressed to a thickness also, but at the present time this is hardly ever necessary.

Setting Out

In setting out the work, place the two stiles face to face and turn them face edge up on the bench. Lay the rod on them and prick off the lines showing the ends of the mortises. Square lines across the edges of the stiles at these points and continue them across the face to the back edge; make the mortises $\frac{1}{4}$ in. wider at each end on the back edge, to allow for wedging. The lines across the face of the stiles must be made with a pencil so

as to leave no marks on the finished door; the lines across the edges can be marked with either pencil or knife-edge as you choose. Each muntin is in the present case set out separately, but if we were making several doors of one size, those of the same length would, of course, all be marked at once, or in such numbers as could be most conveniently handled. When marking a number of pieces like this, always put them face to face in pairs and, if possible, hold them all together with a couple of hand screws. If hand screws are not available, after pricking off the distances on one piece, and still keeping them in pairs, turn them flat upon the bench one above the other with their edges projecting over the bench a little. The square marks can now be drawn across them almost as easily as if they were held, face edge up in the hand screws.

Place all the rails of the door together for marking as described in the foregoing and then cut the lines for the shoulders of the tenons as deeply as possible with a knife-edge. This will assist the tenon saw to cut a nice, clean joint at the shoulder.

One and a half to 2 inches is deep enough for the mortises that are to receive the muntins. Indeed, in some cases, the tenons on these latter are merely made the depth of the plow groove in the rails, but this cannot be considered as anything but poor work. After the ends of the mortises and the shoulders of the tenons have all been marked, take the gauge that has already been set to the width of the mortise chisel, and, working always from the face side, finish setting out the material. Both edges and ends of the tenons are marked, of course, and be sure to get them all, as much time can be wasted hunting up the gauge for a second marking.

Mortising

With the material all marked or, in shop parlance, "set out," the next thing is the mortising, and probably there is not any other portion of the work on which the inexperienced can waste so much time. In doing this work do not grip each piece separately in the bench vise, nor bore the mortises full of holes with a brace and bit, for with proper practice one should be able to

cut such small mortises as these with mallet and chisel in less time than it would take to bore the holes. Take the two stiles; set them back edge up on the bench and seat yourself on top of them. If there were more of them they would make a better seat, but the rails, or any other pieces of wood, may be placed alongside of them, which will both make the seat more comfortable and hold the stiles steadier.

Commence in the center of the mortise with the back of the chisel toward you and work toward the farther end. Lean the chisel a little from you, but hold it perfectly plumb sideways. Take small chips and drive the chisel with one or two decisive blows, but not so far as to have it stick. In fact, work the chisel just as a chisel is worked in a mortising machine, taking small chips and getting deeper with each cut until when the end of the mortise is reached the chisel should be practically half way through the material. Then turn the chisel round, and, starting at that end, cut toward you in the same manner. By the time the full length of the mortise is cut the chisel should be reaching fully half way through the stile, and that side of the mortise will be finished. Cut all the mortises half way through like this, then turn the material over and cut from the face edge in exactly the same way. Do not try to pry the chips out with the mortise chisel; this is necessary only in blind mortises. Some of the chips will naturally work out each time the chisel is removed. For those that do not, after all the mortises are cut, make a drift from a piece of tough hardwood and drive them through with it, working from the face edge.

Many mechanics who have not had the necessary practice look upon this item of mortising as a slow job. This, however, is not the case. Working in pine or woods of a similar nature the writer would undertake to cut any of these mortises in a minute or a little under. This, I hope the readers will understand, is not set forth in a boasting spirit, but merely to dispel any idea that this is a job to be undertaken timidly, with an array of braces, bits and chisels, and much fitting and trimming up afterward.

Cut the blind mortises that carry the tenons of the muntins

exactly as was done the first half of the through mortises, prying out the chips with the chisel after the cutting is finished. The two wide rails may be gripped in the vise while the mortises are being cut, their extra width making them a little awkward to handle otherwise.

Cutting the Tenons

In cutting the tenons, set a rail end-up in the bench vise, and with the rip-saw cut down to the shoulder line, just splitting the line all the way. This is one of the most important parts of the job. The rip-saw must be in good shape, and it is usually best to turn the material and cut from both sides, so as to avoid any possibility of the saw "running." Rip all the tenons to the shoulder line, but do not cut the shoulders until after the plowing is finished.

Plowing

Plow the face edges of the stiles and the top and bottom rails, and both edges of the middle rail and muntins, working from the face side of the material in each case. You will now perhaps see the reason for doing each part of the work in this order. If we had cut the shoulders of the tenons before doing the plow-

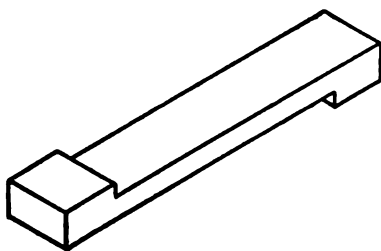


Fig. 84.—General View of a "Bench Hook."

ing there would be nothing for the fence and depth gauge of the plow to work against at the ends of the rails. Also, if we did the plowing before ripping the tenons or cutting the mortises, there would be nothing to guide our saw in one case or our chisel in the other.

With the plowing finished we may proceed to cut the shoulders of the tenons, in which part of the work the "bench hook" pictured in Fig. 84 will be of some assistance. This appliance is cut from a piece of wood about $1\frac{1}{2}$ in. thick, 3 in. wide and 16 in. long. One end of it is hooked over the nearest edge of the bench, while the material to be worked is held against the other. They can be used singly, but are generally used in pairs as in Fig. 85.

Haunching

The shoulders of the tenons require very accurate cutting, which should be done with a tenon saw (or back saw, as it is

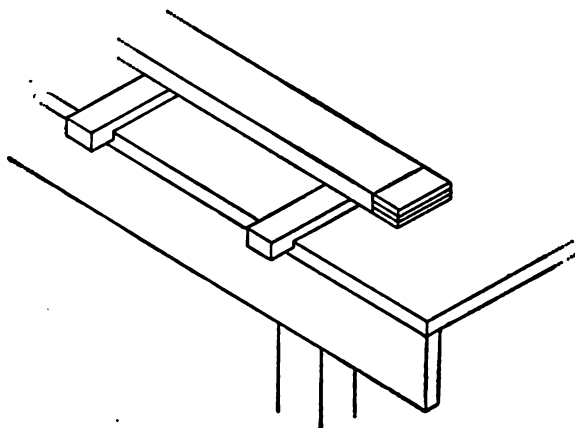


Fig. 85.—Showing Use of a Pair of "Bench Hooks."

sometimes called), and on no account should the saw be allowed to cut into the tenon. After all the shoulders are cut, set the rails end up in the bench vise again and cut the tenons to correct width. They can be marked and cut as you go along. Run the lines with rule and pencil and do not forget the haunching, which is the small piece that is left to fill the plow groove, as shown in Fig. 86. The easiest way to mark the haunching is to have a slip of wood of the correct thickness, lay it on the shoulder of the tenon and run the pencil along it. The waste portions of the tenons are often cut into wedges, as shown by the dotted lines in Fig. 86, to be used when gluing and wedging up the door.

Fielding the Panels

The material for the panels should be dressed as flat and straight as possible and cut squarely to the sizes shown on the rod, allowing about 1/16 in. less in length and width for clearance. To work the fielding, take a $\frac{5}{8}$ -in. plow cutter (a size for

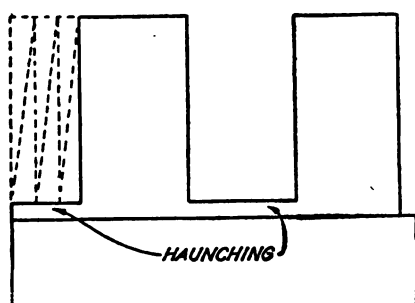


Fig. 86.—Showing the "Haunching" which is Left to Fill the Plow Groove.

which you have little use) and grind the inside corner rounding; try it on a spare piece of board, and when you have it right plow all the panels with it, as in cross section, Fig. 87. The portion between these grooves and the edges of the panel can be finished off with chisel, rabbet plane and sandpaper. The inside corner of the rabbet plane cutter should be ground off or kept back of the cutting face of the plane to prevent it making unsightly marks; and if you choose, plow grooves may be run, as shown by the dotted lines, along the edge of the panels to give the correct thickness. The sides of the panels should be worked first and the ends afterwards. In some woods it is not possible to work the



Fig. 87.—Cross Section of Panel, Showing Plowed Grooves.

plow and rabbet plane across the ends of the panels, in which case they must be worked up with gouge and paring chisel and much scrubbing with different grades of sandpaper. The edges of the panels should be fitted to a "mullet," which is a short piece of

wood plowed with the same cutter that was used for plowing the stiles and rails. The mullet being run around the panels makes certain they will not stick when we are assembling the door. To avoid any hitch in this part of the work it may be better to knock the door together dry and make sure that everything is correct.

Gluing Up

In gluing up be sure the cramps are set the right size and have the glue-pot handy. Lay the two stiles on the saw horses and the rails and muntins above them in their proper order. Glue the tenon of the lower muntin and the mortise in the bottom rail and drive them together; put the two lower panels in place. Glue the other tenon and mortise and drive on the lock rail; put in the upper muntin, then the panels, then the top rail in the same way. Enter the tenons of the rails into the stiles about $1\frac{1}{2}$ in., glue all the tenons on one side, turn the door over, glue the tenons on the other side and drive up the stiles. It is never advisable to glue the tenons for their entire length, as this method of gluing is likely to cause the stile to shrink from the shoulder. If you have a long cramp handy it may be used to bring up the joints between the muntins and the rails, but it is not absolutely necessary. If the work has been correctly done, these joints may be made tight by the proper driving of the outside wedges in the tenons of the top and bottom rails. The cross cramps should be applied as near the tenons as possible, in between the double tenons for preference, and be sure you have them square across the door, otherwise they are liable to pull the door out of square. And by the same token, if for some reason the joints do not come up square, setting the cramp out of square in the opposite direction will remedy the defect, which is a more workmanlike method than picking the door up bodily and dropping it upon one corner.

Fixing the Moldings

After the door has been cramped and wedged it should be set on one side for a few hours for the glue to dry, although if pressed for time the quarter round moldings may be planted

round the panels while the cramps are still on the door and before it is "cleaned off." The fixing of so simple a molding does not present any difficulty. Cut the short pieces in first and spring the long ones in between them. The moldings should in all cases be braded to the stiles; if they are fixed to the panels the shrinking of these latter will draw the moldings from the stiles. If they are fixed to both stiles and panels, this same shrinking is liable to split either the panels or the moldings.

Cleaning Off

In cleaning off the door after the glue has set use a short jointer or fore-plane to bring the parts straight and level, and finish off with smooth plane and sandpaper.

CHAPTER IX

WINDOW FRAME CONSTRUCTION

IN considering the matter of window frame construction—the subject of the present chapter—the writer has deemed it advisable to show a number of different methods so as to render the subject of more general interest to readers in different parts of the country. A design of window frame that would answer every purpose in the sunny valleys of California might be entirely out of place in other sections during the winter months, and as it is impossible to illustrate one design and declare that it is “the best under all conditions,” a variety has been presented and the reader may make such selection as best suits his own ideas or locality.

Sections of Box Window Frames

Different sections of box window frames are illustrated in Figs. 88 to 92. This window is known by various names, such as “English,” “Double Hung,” “Check Rail,” etc. Fig. 88 shows about the cheapest make of this style of frame it is possible to construct. It consists of pulley stile and outside casing nailed together to form the frame, the box being finished with the in-



Fig. 88.—Section of Simple Style of Box Window Frame.

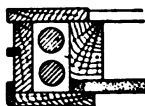


Fig. 89.—Box Frame Finished with Inside Casing, also Used for Sliding Windows Without Weights.

side casing, as in Fig. 89, after the window is in position. This style of frame is also used for sliding windows without weights, in which case the wall studs are set to come close up to the pulley stiles.

The section of frame shown in Fig. 90 is of slightly different construction, having an extra strip fitted between the pulley stile and the outside casing. This strip is called a "blind stop," but is often used in windows that have no outside blinds. Where blinds are used they are hinged to the outside casing, the thickness of which is increased to equal that of the blinds.

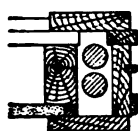


Fig. 90.—Section of Frame Having an Extra Strip Fitted Between Pulley Stile and Outside Casing Called "Blind Stop."

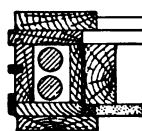


Fig. 91.—Section of Window Frame Suited to Cold Climates and Generally Used in Brick Walls.

A still better class of frame and one more suited to cold climates is that illustrated in Fig. 91. Here the pulley stile is tongued into the outside lining as can be plainly seen in the illustration. This, of course, makes a more effective weather joint than that in which the lining or the casing and pulley stile are merely nailed together. The back lining is often omitted in this frame and the wall stud made to take its place, in which case the inside lining must be left loose to be fixed after the frame is in position. Where the frames are placed before the plastering is done the grounds for the plaster are omitted and the lining made of the correct thickness to answer for that purpose.

Frame for Brick Wall

Fig. 91 represents the style of frame generally used in brick walls, but in that case the back lining is often of thin stuff and nailed to the other lining as in Fig. 92, instead of being cut in between them. Brick walls are frequently much thicker than the window frames, so that most frames for this purpose have a plow groove on the inside to receive the jamb lining which is cut to the

proper width and fitted to the frame after the latter is fixed in place. It is not usually considered a part of the frame.

The writer has thought it best to keep the sketches as free as possible from reference letters. He feels that even the novice will understand what is meant by jamb lining after an inspection of Fig. 92.

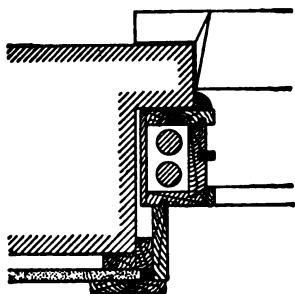


Fig. 92.—Construction of Window Frame as Used in Connection with a Brick Wall.

Where openings are left in the wall and the frames fitted afterwards the molding shown on the outside of Fig. 92 should be removed and fastened to the frame after the latter is in place. To make a first-class job it is frequently necessary to scribe this molding

to the brickwork. Wherever possible, however, the frames should be set and the brickwork built around them, this making by far the better job. In some localities the sills of windows for brick walls are made without any projection so that the molding runs down past and stops on the stone sub-sill, but the writer has never been able to see any advantage in the method.

Construction of Head and Sill

A vertical section of a double hung box window frame is shown in Fig. 93, which represents in detail methods of constructing the head, the sill and the weight pockets. The construction of the head does not vary much in any of these frames, being practically the same as the sides with the back lining omitted. Of different designs of sills, however, there are quite a number, three of which are illustrated in Figs. 94, 95 and 96. Different combinations of the ideas presented in these three illustrations are often used. Note the bevel between the lower edge of the sash and the apron in Fig. 96. This bevel could be used with either of the other designs and is a good feature, for it makes a tight-fitting joint for the sash when down and preserves the upper edge of the apron or stop bead, which is so

liable to get broken and slivered when left square as indicated in the other sketches. The drawings also show two different methods of grooving the under side of the sill for the siding. Where the method indicated in Fig. 95 is used the ends of the sill must be "returned"; the return sill looks better for the other designs also, but is not an absolute necessity.

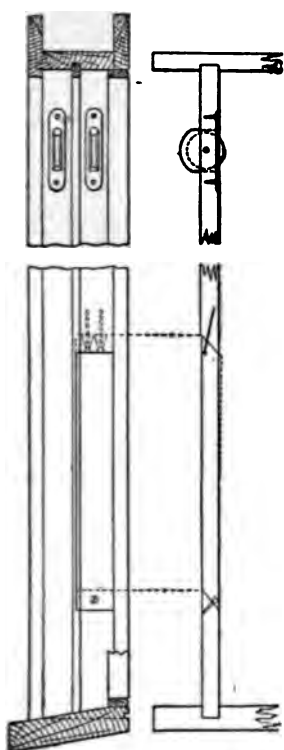


Fig. 93.—Vertical Section of Double Hung Box Window Frame.

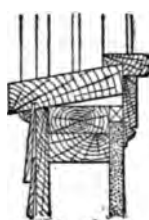


Fig. 94

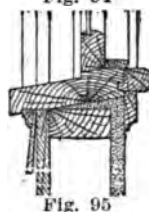


Fig. 95

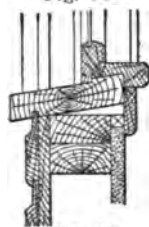


Fig. 96

Figs. 94, 95 and 96.
—Different Designs of Window Sill Construction.

Reverting again to Fig. 93 it will be seen that the pulley stile is shown grooved or housed into both head and sill. This is the general practice, though sometimes the sill is housed into the pulley stile instead. This usually happens when the sill is of plain section as indicated in Fig. 94, in which case nothing but a

parallel groove at the proper angle is required in the stile. This necessitates less work and is easier than housing the sill. In case of molded or rabbeted sills, however, the other method is easier.

Pitch of Sill

The dotted line through the sill in Fig. 93 shows the depth of the housing and the full length of the pulley stile. The housing is sometimes made a little wider than the thickness of the stile, and the latter is made fast with wedges before being nailed. The sill has a pitch of 2 in. to the foot, or as it is more commonly expressed of 1 in 6. In exposed situations this pitch may be increased with advantage. It is the general practice to make the sills of parallel thickness and cant them as shown, to get the necessary pitch, this saving some material and answering for all cases except where the plan of the window is curved, in which case it becomes necessary to use the solid sills.

Cutting Pocket Holes

There are several different methods of cutting the pocket holes, that illustrated in Fig. 93 being the easiest and about as good as any. The piece cut out is utilized to make the pocket piece. The size of the pocket opening varies with the size of the window. It is placed from 6 to 8 in. above the sill and is about 3 in. shorter than the weights—16 in. is average length.

The cut down the center of the pulley stile is best started with an automatic drill. After two or three holes have been bored close together with this instrument, the end of a compass saw can be inserted and the cut made. Two angle cuts through the edge will then remove the piece. In fitting it back again two 8d. finishing nails are driven into the upper end of the opening as shown by the dotted lines in the face of the pulley stile and by the full lines in the side elevation. The V-shaped slots to fit over the nails are cut in the upper end of the pocket piece, which is then put back in place and a wood screw is inserted at the lower end as shown. On account of the saw kerfs the pocket

piece must be brought forward slightly to make a good joint, which causes it to project a little from the face of the pulley stile as shown in the elevation by the dotted line. This projection is dressed off after the pocket piece is in place. Where the pulley stile is tongued on its inner edge, as in Fig. 92, it is necessary to remove a portion of the tongue on the pocket piece, otherwise its removal or replacement is difficult.

Fixing Pulleys

The sash pulleys are fitted as shown, the top of the pulley being kept from 2 to 4 in. down from the head according to the length of the window. The pulleys should be set out equally on each side of the parting bead groove, in the center of the path of the sash.

Setting Out

In setting out and making a window frame, commence with the pulley stiles. In a frame building the width of the stiles is governed by the size of the studding; in a brick building, by the size of sash. It is always best to set out the vertical and horizontal sections of the frame on a rod—as described in Chapter VIII for the making of a door—so that the material may be marked direct from the rod without any further measurement. Dress the material to the correct width; take it out of wind and mark the face and face edge. Plow and rabbet the pulley stiles and head; cut the pocket holes and fix the pulleys. Finish all work of a similar nature before changing the plow or rabbet plane. Cut the pulley stiles, head and sill to the correct size—working from the rod—and cut the housing for the pulley stiles in the head and sill. The full lines in Fig. 97 represent a plan of the end of the sill and the shape to which it is cut, while the dotted lines indicate the position of the weight box over it. The front lining sits on the sill, the back and inside linings run down past and are nailed to it.

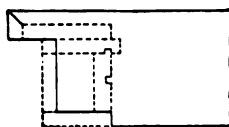


Fig. 97.—Diagram Showing Plan of End of Sill with Dotted Lines Indicating Position of Weight Box Over It.

Assembling Frame

The frame is now ready to go together. Nail the head on to the stiles, keeping them parallel or out of winding with each other and then nail the stiles to the sill. If there is more than one frame of the same size to be made it will pay to construct a rig for assembling them. It need be nothing more than a couple of beveled blocks fixed to the bench at one end, that will hold the sill at the proper bevel and two cleats at the other end with wedges that may be driven in to bring the joints of the frame up tight. The frame is put together, outside face up, or so that the projection of the sill will not prevent it lying flat on the bench. After the stiles are fastened to the sill the frame is squared from corner to corner with a rod and the outside linings fixed in place. The side linings run through and the head lining is cut in between them except where the outside casings are made to do service for the linings, as in Figs. 89 and 90, in which event the head casing runs through and the side casings are cut in under it in the usual way. These casings and linings are cut to correct length as they are fitted in place.

With the outside linings on, turn the frame over, placing it so that the sill hangs over the end of the bench and apply the inside linings in the same way. *Do not nail through the lining into the pocket piece.*

The parting bead and the stop bead are now cut and fitted and our frame is finished. The parting bead is held in its groove by friction only, and the stop bead is bradded temporarily in place until such time as the sash is fitted.

Figs. 88 to 97 are all to a scale of 1 in. to the foot, and the size of any member can thus be readily found. No attempt has been made to show in the sketches molded casings or other fancy trim—those illustrated being merely for the purpose of indicating their position.

Casement Windows

Casement windows should in all cases have solid jambs, and are divided broadly into two classes—those opening outward and those opening inward. The greatest trouble with these windows

is to make them weatherproof, and to accomplish this more different methods have been devised than would fill a good sized book. The windows opening outward are not troublesome, as they are

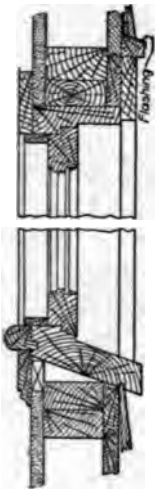


Fig. 98.—Vertical Section of Outward Opening Casement.

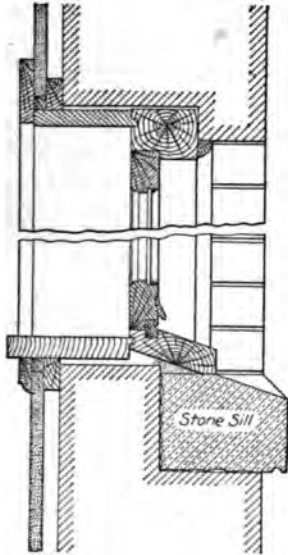


Fig. 100.—Vertical Section of Inward Opening Casement

usually much smaller than the others, and the pressure of the wind tends to close them tighter instead of forcing them open; in fact, it is no more difficult to make an outward opening casement weatherproof than it is a pair of hung sashes, but to do as

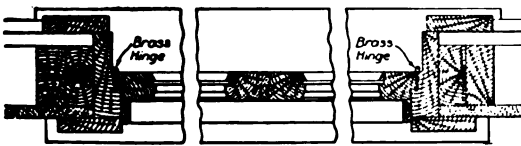


Fig. 99.—Horizontal Section of Outward Opening Casement.

much for the inward opening casement is quite another matter.

A vertical section of an outward opening casement is shown in Fig. 98 and a horizontal section in Fig. 99. Both sketches are

drawn to scale, and the construction is so clearly indicated that a detailed explanation should not be necessary.

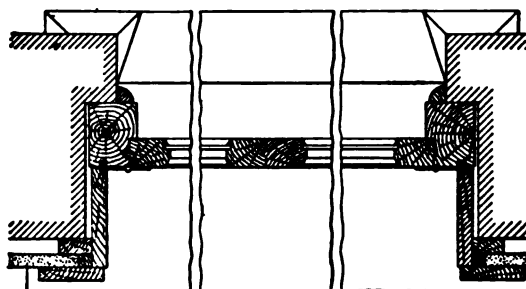


Fig. 101.—Horizontal Section of One Style of Inward Opening Casement.

One design of inward opening casement is shown in Figs. 100 and 101 and another design in Figs. 102 and 103. The former sketches illustrate a frame for a brick wall, the others a frame for a shingled exterior where outside casings are not desired.

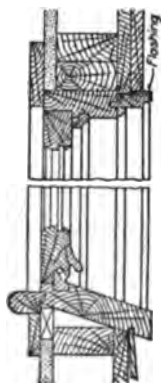


Fig. 102.—Vertical Section of Inward Opening Casement for Shingled Exterior.



Fig. 103.—Showing Construction of Joints.

and any mechanic who has ever used one of these planes on a piece of red pine knows exactly what hard work feels like. It is not necessary to take my word for this, as any one of the boys who served his time with the writer will tell you the same thing, or if you can find a pair of these planes you may prove it for yourself. The joints of the window shown in Fig. 103 can be worked without any special planes, and the final result is in all probability equally as good.

The Joint at the Sill

The most vulnerable part of these windows is the joint at the sill. In some localities any old kind of a joint seems to answer and in others it will seem impossible to make a joint that will keep out the water. In the open country where the wind can get a good sweep it dashes the rain against the window panes, from whence it runs to the sill. Here the wind prevents it draining off, especially if the sill is of flat pitch and if there is any chance at all will blow it through the joints into the house. Any joint formed after the principle of Fig. 104 is defective, Fig. 105 being much better. The wind will fill the space in front of the tongue in Fig. 104 with water and then work it over the tongue to the inside. In Fig. 105 water will accumulate

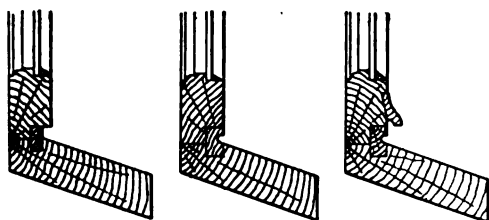


Fig. 104.—A Defective Sill Joint.

Fig. 105.—A Better Construction.

Fig. 106.—Proper Construction of Joint at Sill.

in the corner between the sill and the tongue, and some of it may be driven through the joint, but only that can be driven through that gets directly opposite the joint, and we have not, as in the other case, a funnel-shaped opening to lead it there.

If we put a "throat" in the tongue and fix a drip mold on the sash, as in Fig. 106, we have done about all that can be done to keep out the water. The drip mold will keep the water from the joint as it falls to the sill, and the throat in the tongue will in most cases prevent it rising again. Still, supposing these things fail and water does get in, let it collect in the small groove shown in Fig. 102 and run out through the drain holes represented by the dotted lines. These holes are placed near the ends of the sill and are bored in a slanting direction toward the jambs

so that the wind has no chance to drive the water back up through the holes.

Construction of Meeting Stiles

The jambs of the frame shown in Fig. 102 are the same as the head, and the construction of the meeting stiles is plainly shown in the enlarged detail, Fig. 103. The two beads in the joint are of hardwood and require to be well fitted and must be firmly fixed in place. The jambs can be made as shown or worked in one piece. The sill also can be worked in one piece instead of being fitted with a tongue, which, however, will mean a considerable waste of material and energy. The small molding grooved into the face of the jamb should be placed to press tight against the sash, and the workmanship and fitting of all the work in connection with these windows must be first class. It is much easier to make them fit properly in the first place than afterwards.

In putting the frames together the jambs are usually housed into the head and sill, but a mortise and tenon in conjunction with a smaller housing is a much better class of construction.

CHAPTER X

SHOWCASE CONSTRUCTION

SHOWCASE making is a trade almost as much apart from carpentry as is piano making; the showcase maker often being as much a worker in metal and glass as he is in wood. For our present example we shall confine ourselves to the cases having wooden framework, considering the metal or metal-bound ones as being outside our province.

Requirements of Showcases

The most important requirements of a showcase are that it shall preserve the contents from dust and other atmospheric conditions and at the same time leave these contents as open as possible for inspection. To fulfill these conditions, the joints and fitting of the woodwork must be first class and the members must be as small as possible so as to leave an uninterrupted view of the interior of the case. The glass must be accurately cut to size and shape so as to fit tightly, and ought in all cases to be cemented to the woodwork. Where much of this work is done it will be better to use some of the manufactured quick-drying cements; but for a small job a cement made of white lead and boiled linseed oil mixed to a stiff putty, with a little Japan dryers to hasten the setting. The putty should be colored to match the finish of the woodwork.

Joints for Vertical Members

We will first consider some of the joints that are likely to be useful in this class of work. Referring to the sketches, Figs. 107 to 117, inclusive, show a variety of angle joints between vertical members, such as the sides or corners of the cases. Figs 118 to 122, inclusive, show angle joints for the horizontal members, such as the tops and bottoms.

Fig. 107 represents a miter and feather joint. The two pieces are first dressed to a miter, then each piece is plowed with a groove about $\frac{3}{16}$ in. wide by $\frac{1}{4}$ in. deep, into which is fitted a tongue, or feather, as shown. The tongue is made of hard wood and so cut that the grain runs across it instead of lengthwise. This is what is known as "a cross tongue," and if properly fitted it is much stronger than a tongue in which the grain runs lengthwise.

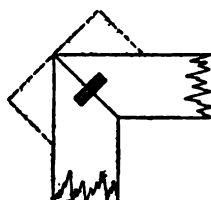


Fig. 107.—A Miter and Feather Joint.

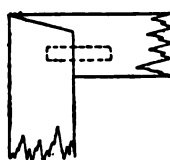


Fig. 108.—A Miter and Butt Joint.

The joint shown in Fig. 107 is not so hard to make as might at first be supposed. Having dressed the pieces to the proper angle, glue a small strip of wood to each piece as shown by the dotted lines. With the material fixed to the bench in any convenient manner these angular pieces will form guides for the fence of the plow and enable us to make the grooves at right angles with the face of the miter. They also form convenient places for applying the cramps that are used for drawing and holding the joint together while the glue is setting.

Paper Glued Under Guide Strips

A piece of paper should be glued between the guide strips and the material so as to make them easy of removal, and the face, or working edge, of the strips should be dressed to the correct angle after they have been fixed in place. After the strips have served their purpose a chisel or dull knife will split the paper and they will come away easily, while the portion of the paper adhering to the material may be removed with an ordinary cabinet scraper.

Leave Scraping and Sandpapering Till the Last

This is, perhaps, a good place to remark that when the average carpenter turns his hand to cabinet making he often makes the mistake of scraping and finishing his material too early in the job. Work that is to be finished in the natural wood must go to the finisher's hands in an absolutely clean condition. To have it do this a final sandpapering and scraping must be the carpenter's last item on the job, and a good deal of time can often be saved

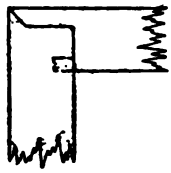


Fig. 109.—A Miter and Rabbet Joint.

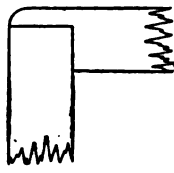


Fig. 110.—A Rabbet and Butt Joint.

by leaving as much as possible of the sandpapering and scraping for this final operation.

Referring again to the sketches, Fig. 108 represents a miter and butt joint and Fig. 109 a miter and rabbet. There is more difference between these two joints than appears at first glance, Fig. 108 being much the easier to make. Both of these joints need something more than glue to hold them together. Where nails or screws cannot be used they may be doweled as shown by the dotted lines in Fig. 108 or tongued as in Fig 109. When making such joints as these, be careful to so arrange the tongue and groove—or the dowels—that they draw the joint together instead of holding it apart.

What is meant by this is as follows: Put the groove just a shaving further from the edge than the thickness of the piece on which the tongue is formed, so that when the two pieces are driven together the miter will be drawn up tight. There is not, of course, much leeway, but it is better to have a little too much draw to the joint than to have the groove so near the edge that it holds the joint open at the miter.

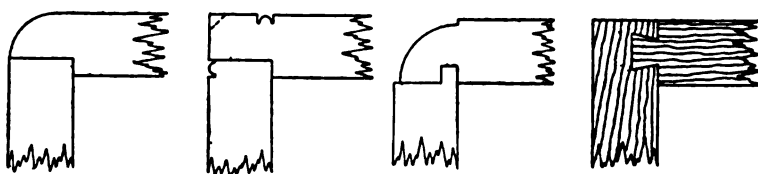
The joint shown in Fig. 110 has a much better appearance

in the finished article than the sketch would lead one to suppose. It is more useful where the grain of the wood runs horizontally, in which case the rounding of the corner serves to disguise the small portion of end wood that shows.

Intelligent Nailing

In coarse-grained woods, such as oak or ash, it is possible to nail these corners in a manner that is almost invisible. Use fine brads, cut the heads off with a pair of pincers or pliers just before you finish driving them and set them with a nail-set having an end like a miniature screwdriver. If the nailing is done with intelligence the marks made by the nail-set can be fixed to imitate natural marks in the grain of the wood, and once the article has had a coat of filler they are invisible to the casual observer. No putty is used in these nail holes—nothing but the filler, which fills them at the same time as it is being rubbed into the pores of the wood. Figured woods, such as burr, walnut or birdseye maple, are the only ones needing a nail set with a round point. For all other kinds the chisel point is better.

Figs. 111 and 112 represent two other styles of rabbet joint, while Fig. 113 shows a tongue and groove joint. The molds



Figs. 111 and 112.—Other Styles of Rabbet and Butt Joint.

Fig. 113.—A Tongue and Groove Joint.

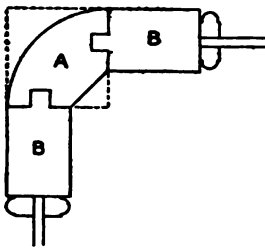
Fig. 114.—Dove-tail Joint.

shown on Figs. 111 and 112 can, of course, be used on Fig. 113 and vice versa, also the tongue on Fig. 113 can sometimes be placed in the center of the piece instead of at the side.

Fig. 114 is particularly useful for joining two pieces that have their grain at right angles; as, for instance, in joining a horizontal member to a vertical one. Supposing that in Fig. 115 the piece "A" formed the entire corner of the case and that the pieces "B-B" instead of being vertical stiles were the ends of

the horizontal top and bottom rails. Fig. 114 is then the best joint that can be devised for making the connection.

Figs. 115 and 116 show different methods of making round corners on large cases. The dotted lines show the original sizes and shapes of the corner pieces. It will hardly be necessary to



Figs. 115 and 116.—Showing Methods of Making Round Corners.

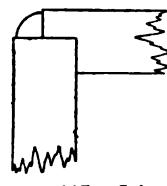
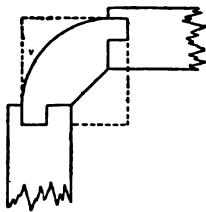


Fig. 117.—Joint with Molding in the Angle.

say that the grooves on the one piece and the tongues on the other should be worked before the corner is rounded.

Fig. 117 shows a joint that was much used a few years ago. It has a rope molding or other fancy finish planted in the angle at the corner.

Joints for Horizontal Members

The joints for the horizontal members, Figs. 118 to 122, will not require much describing. Fig. 118 shows miter and cross tongue; Fig. 119 miter and dowel; Fig. 120 miter and tenon, and Fig. 121 miter and dovetail. Fig. 121 can also be used with square shoulders instead of the miter and is then a capital joint for narrow members, such as are often found in counter showcases.

Fig. 122 shows the ordinary blind mortise and tenon with square shoulders. Since the advent of the so-styled "Mission" furniture this joint is more common in cabinet work than formerly, often taking the place of what would here-

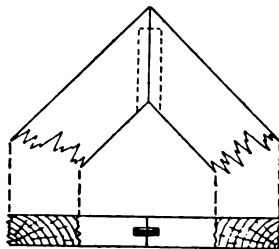


Fig. 118.—Another Form of Miter and Feather Joint.

tofore have been a mitered joint. There is no good reason why this should not be, as it is easier to make and stronger than a mitered joint, while so far as the item of appearance is concerned

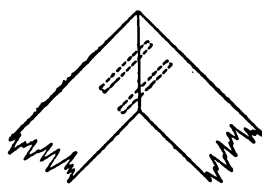


Fig. 119.—A Miter and Dowel Joint.

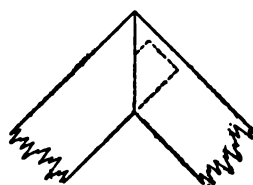


Fig. 120.—A Miter and Tenon Joint.

it is all a matter of taste. Probably not more than one in ten people who use showcases could tell for certain whether the corners of their cases are put together with miter, square shoulder, or 40d. common nails. At the same time that is no excuse for

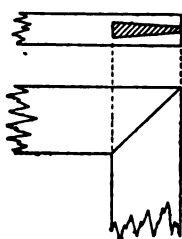


Fig. 121.—A Miter and Dovetail Joint.

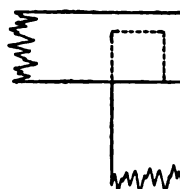


Fig. 122.—A Blind Mortise.

one to "scamp" his work, and a variety of joints have been shown so that the reader may select those that best satisfy his capabilities or requirements.

Simple Design of Showcase

Fig. 123 represents a broken cross section of a showcase that has a passable appearance and does not present any unsurmountable difficulties to the average carpenter. The sketch shows the construction so clearly that a detailed explanation is not necessary. The back ends of the sides should be rabbeted like the top and bottom to form a check for the doors. The bottom is a

paneled frame with the panels flush on the inside. The runners for the doors are shown in the sketch as if they were worked solid. They were merely drawn this way to show more clearly to which pieces they were to be fixed. Two long runners are fixed in grooves provided for them in the top of the case and short ones are fixed in the same manner to the bottoms of the doors.

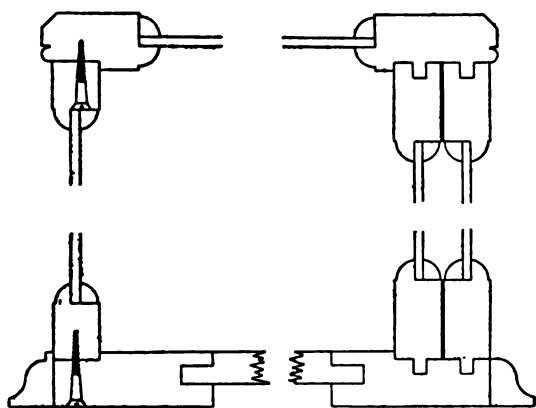


Fig. 123.—Broken Cross Section of One Style of Showcase.

A base molding mitered around the case serves to hide the joint between the sides and the bottom. The upper edge of this molding is removed at the back so as to have no projection above the bottom of the case. It is for the same reason that the runners are fixed to the doors at the bottom instead of to the case.

Another Style of Showcase

An article more like those the showcase maker turns out is indicated in Fig. 124. It is represented with hinged doors instead of sliding, which is, of course, a matter of individual preference or selection. Hinged doors usually have wooden panels instead of glass and are frequently equipped with mirrors on the inside. Fashion and styles appear to change with showcases as with everything else. Years ago most of the counter

cases had sloping fronts; now they are more often made square. The woodwork of the case in Fig. 124 is more "fiddling" than difficult. The upper and lower rims are glued up separately and after the glue is dry mortises are cut in them to receive the ends of the corner standards. The upper rim is fitted and glued while the material is square and then rounded afterwards. The front and back standards are the same section as the front and back

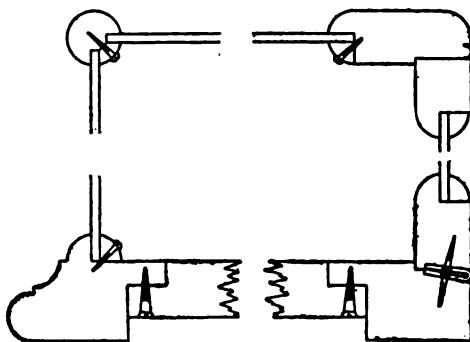


Fig. 124.—Broken Cross Section of Another Style of Showcase.

upper rim respectively. The sides of the upper rims are the same as the front. The tenons on the front standards are about $\frac{3}{8}$ of an in. square. The lower ends of the standards should be mitered to the base molding. The upper ends may be mitered to the rim or they may be fitted and fixed to it, while it is of square section. In this latter case the rounding of the under side of the rim will stop at the corner standard instead of running straight through.

Fixing the Glass

The glass is fixed in this case from the inside—the bottom being left off for that purpose—and it is a good idea to fit and screw the small moldings that hold it in position into their proper places while the case is still in sections. They will, of course, have to be removed before the glass can be placed, but the screws run in much easier the second time than they do the first, especially if one is working in cramped quarters.

Covering the Bottoms

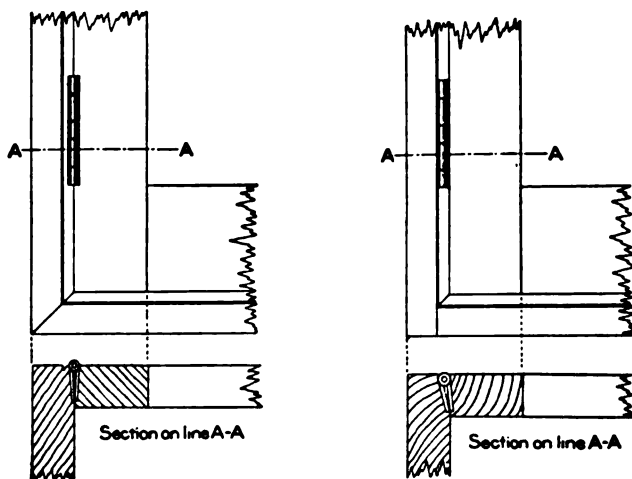
The bottoms of these cases may be covered on the inside with billiard cloth glued into place, or they may be fitted with removable velvet mats or small wooden trays, depending upon the class of goods for which they are to be used.

The position in which the hinge is shown in Fig. 124 will, no doubt, appear strange to some readers. It and some other hardware items will be discussed in the chapter following.

CHAPTER XI

CABINET HARDWARE

AS a general thing the average carpenter knows and practices only one method of fitting butt hinges, and that is to sink each leaf of the hinge equally into its receptive portion of the woodwork so as to have the knuckle of the hinge show the same amount on each side of the joint of the door. This is the accepted method of hanging room doors, and answers well enough for that purpose, but when we come to cabinet work it is often found that other methods of placing or fitting the hinges will add a little to the neatness and finish of the article.



Figs. 125 and 126. Elevations and Horizontal Cross Sections Showing Two Different Methods of Fitting Hinges.

In order to emphasize this point these items of cabinet hardware have been carried over from the preceding chapter.

Different Methods of Fitting Hinges

In Figs. 125 and 126 are shown two different methods of fitting hinges. In Fig. 125 the hinge is fitted as you and I have

often seen them; that is, with the hinge sunk equally into both door and jamb and with the knuckle projecting anywhere from $\frac{1}{8}$ to $\frac{3}{8}$ of an inch.

In Fig. 126 an improvement on this method has been attempted, the knuckle of the hinge being kept flush with the surface and entirely sunk in a bead that is worked on either the door or the jamb—preferably the latter. The bead is made exactly the same size as the knuckle, and, as shown in the drawing, the hinge is set on a skew, the recess that is cut in the door for it tapering from nothing at the outer edge to the thickness of one leaf of the hinge at the inner edge, while the recess that is cut in the jamb tapers from the entire thickness of the hinge at the outer edge to the thickness of one leaf at the inner. This method of fitting does not, perhaps, look quite as neat when the door is open, but it more than compensates for this by the neat appearance of the outside of the case when the door is closed.

There are other ways of fitting the hinge so as to have the knuckle sunk in a bead. One of them is to sink in the entire hinge on one side and not at all on the other, as is indicated in Fig. 127. This is an easier method, but not nearly so good. Sometimes the hinge is sunk into the door in this way instead of into the jamb; as, for instance

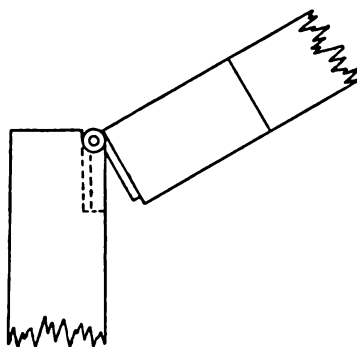


Fig. 127.—A Cheaper Method of Fitting the Hinge.

when the door is hinged to a pilaster which projects some distance in front of it. In this case the hinge is often sunk entirely into the door, even when there is no bead on the door to hide the knuckle.

An Old Time Method

In Figs. 128 and 129 is illustrated an old-time method of fitting hinges that is now seldom met with. The bead is worked as usual the same size as the knuckle of the hinge, and then both

pins, but could see no way to avoid it and admitted that it was his own fault for not having had the casings kept further back. Mounting to the floor above the difference in the appearance of the casings at once caught the foreman's eye, and the method of fitting the hinges had to be explained to him, although to the writer it appeared perfectly obvious. Now if you think, gentle reader, that Mr. Foreman was unusually dense, let me say that since that time I have more than once seen a man pound away with hammer and screwdriver at the pin of a hinge until he knocked the top of it off before it occurred to him to take the screws out of the hinge.

Once Mr. Foreman had grasped the idea, he descended to tell Billy what he thought of a man who couldn't fit a common hinge without spoiling a hardwood casing. Scraps of the argument that floated up to me were more profane than logical, and had more to do with thick heads than with the matter in hand, but Billy had the best of the discussion because the foreman had already admitted that Billy's was the only way to do it. Whether the winning of the argument did Billy any material good is another matter.

A Makeshift Bead Plane

Before leaving this subject of beads and hinges I wish to describe a little "kink" which, though fairly well known among woodworkers, has not, so far as I am aware, been illustrated before. It is pictured in Fig. 131, and consists of a small block of hardwood with a wood screw inserted as shown. It is used for making small beads on the edges of woodwork and is worked just like a marking gauge.

Fig. 132 shows an end view of it applied to the edge of a board and also shows the shape into which the board is formed by it. A few strokes with the plane on the outer corner and a little rubbing with sandpaper will convert this into a very presentable bead. Different sizes of screws should be used for different sized beads, but it is not advisable to attempt beads larger than $\frac{1}{4}$ of an inch, its chief use being to make those that are too small to be worked with the ordinary bead plane. For this pur-

pose it is an excellent little scheme and can be worked on end grain or on the edges of curved pieces just as easily as it can on straight.

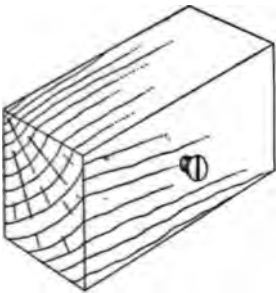


Fig. 131.—A Makeshift Bead Plane.

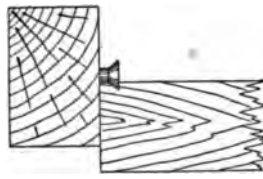
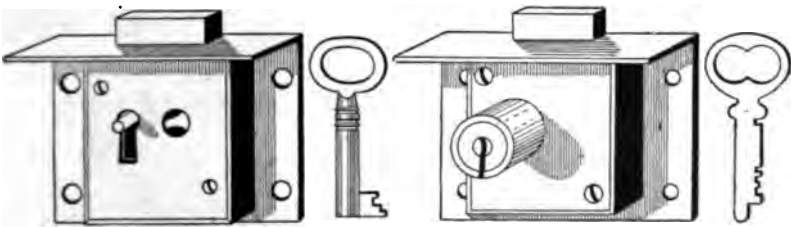


Fig. 132.—Method of Using the Makeshift Bead Plane.

Cabinet Locks

After the hinges, the most important item of cabinet hardware is the locks. Many people would consider the locks the more important of the two, but we are looking at the matter from the carpenter's viewpoint and it is more of a job to properly fit a pair of hinges than it is to fit the lock, although, of course, an otherwise good piece of cabinet work can be easily spoiled by the improper fitting of either.

Great improvements have been made in cabinet locks of late



Figs. 133 and 134.—Two Styles of Drawer or Till Locks.

years, and it is a good idea for the jobbing carpenter to keep thoroughly posted concerning the different kinds so that he may be able to select those which will best suit his purpose. The local

hardware dealer does not always carry a full line and as a general rule is more interested in disposing of those he has on hand than in ordering new varieties.

The style of lock shown in Fig. 133 is now—in the best work—almost entirely superseded by the cylinder keyhole, flat-keyed variety illustrated in Fig. 134.

Fitting Keyhole Lock

In order to fit the lock shown in Fig. 133 measure the distance from the top of the lock to the center of the pin in the keyhole and bore the hole for the top of the keyhole, making it but a very little larger than the barrel of the key and working from the outside of the drawer front.

It will be noticed that the keyhole is not in the center of the lock, and the inexperienced sometimes make mistakes by reason of their cutting the gain for the lock in the center of the drawer and boring for the keyhole afterward. This naturally throws the keyhole out of center and gives a lop-sided appearance to the drawer front. With the top of the keyhole bored, place the lock on the inside of the drawer with the pin in the center of the hole, and mark the position of the top plate of the lock. Mark the width of this plate with a gauge and cut the gain for it. Place the lock upside down in this gain and mark the position of the box portion of the lock. Mark the depth of the box with a gauge and cut out the gain for it with chisel and tenon saw. Place the lock in position and mark around the selvage or back plate with a knife-edge, cutting as deeply as possible so as to make the work of gaining for the back plate easy. When this has been done the fitting of the lock proper is completed with the exception of finishing the keyhole.

The best tool for this job is the small, sharp blade of a knife. Now that the gain for the lock has been cut there is very little wood left near the keyhole, which is one reason for leaving this part of the work till now. Keep the keyhole as small as possible, especially if there be an escutcheon to go in front of it, in which case the hole in the wood should not be larger than that in the escutcheon so as to make the key easy of insertion and to avoid

pulling the escutcheon off with it on its removal. Sometimes in cheap work the back plate of the lock is not sunk in flush with the wood. It must be decided at the commencement which method it is intended to follow, because where the back plate is not let in flush the gain for the top of the lock will not be so wide by the thickness of this back plate. Be sure the screws are the proper size for the holes of the lock; screw-heads projecting on the inside of drawers are often the cause of serious scratches both on people's fingers and on articles placed in the drawers.

Mortising for Lock Bolt

The mortise for the bolt of the lock in the drawer framing does not have to be exactly the same size as the bolt of the lock, but care must be exercised to have the front side of it in the right location. Take the distance from the front of the drawer to the front of the bolt and mark this distance on the framing with a gauge. Cut the mortise for the bolt behind this mark and, as the drawer stop prevents the drawer going in beyond a certain distance, the drawer cannot rattle once the bolt is turned, no matter how large the mortise.

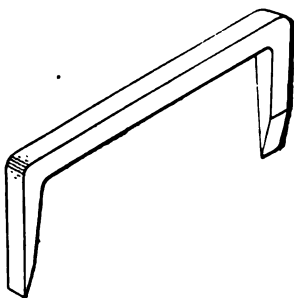


Fig. 135.—A Lock Chisel.

A Lock Chisel

In shallow drawers, where the framing is close together, these mortises are difficult to cut with an ordinary wood chisel, but with the little tool illustrated in Fig. 135 they can be cut easily. The device is made of a piece of $\frac{1}{4}$ -in. square tool steel with about

1 in. of the ends turned at right angles and a chisel point formed on each end as shown. One point setting lengthwise and the other across. The writer has also made use of a screw driver constructed in this way, but, of course, with screw-driver points instead of chisel points.

Fitting Cylinder Lock

The lock shown in Fig. 134 is fitted in much the same way as that shown in Fig. 133. A hole the correct size for the cylinder is bored from the face of the drawer front and the other operations are the same as before. Very accurate measurements must be taken, for it is impossible to have a neat-looking job if the hole has to be altered after it has been bored. In coarse-grained woods, such as oak, it is a good idea to make a start for the nose of the bit with a marking awl, as the hard spots in the grain have a tendency to run the nose of the bit out of place. It is also well to keep the hole for the cylinder just a shaving lower than the measurements show, because the lock will look better a little below the top of the drawer front than it will a little above it and it is easier to take a shaving off the top of the drawer than it is to lower the lock.

Opening Locked Drawers

Figs. 136 and 137 illustrate two other styles of drawer locks, although Fig. 137 may be more properly described as a desk lock. Like all locks with latch bolts, that shown in Fig. 136 is practically useless as far as security is concerned, being opened almost as easily with a knife-blade as with a key. The action is simple; with the left hand press the drawer back as far as it will go, so that the front of the latch does not bind on the strike plate. Pass a dinner-knife blade or any other thin piece of steel through the joint between the drawer and the framing and bring it over the lock bolt from behind. If there is anything to prevent the knife blade being passed over the bolt from behind, the bolt can be forced back by pressing a sharp-pointed instrument against the front side of it and prying down, alternately holding the bolt tight and loose against the strike plate with the left

hand so as to hold what you have and get a fresh grip with the instrument.

There is very little security anyhow in the majority of drawer fixtures, especially if the drawers are wide ones. The bolts of drawer locks rarely exceed $\frac{1}{4}$ of an inch in length, while $\frac{1}{16}$ of an inch is not an extraordinary amount of play for the drawer, and if the latter is 2 ft. or more in width a thin wedge of soft

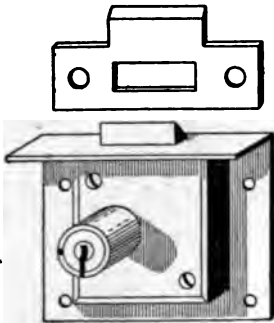


Fig. 136.—A Till Lock with Latch or Spring Bolt.

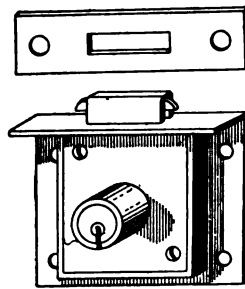


Fig. 137.—A Desk Lock.

wood driven in at the top of the drawer will usually spring the framing the other $\frac{3}{16}$ in. and allow the drawer to open and all of this without leaving anything to show the drawer has been tampered with. In cases of extra wide or poorly fitting drawers the wedge is not needed, as a good strong pair of hands—one on the drawer-pull pulling down and out and the other lifting hard at the desk top—can often spring the woodwork far enough to allow the bolt to pass.

A Personal Experience

The writer well remembers the look of amazement on the face of a certain pompous old personage when the foregoing was demonstrated to him on one of the drawers of his mahogany writing table. We never refused any kind of a job in our shop from putting in glass to putting up stove pipes, and when Mr. So-and-So telephoned the boss that he had lost his keys and must have his desk opened at once, I was sent to see what could

be done in the matter: that is to say, I was sent to fix it, for there was a good deal of friendly rivalry amongst us, and a fellow had to be good natured indeed to stand all the fun that was made at his expense if he ever came back and said that a job was beyond him. Mr. So-and-So did not seem any too well impressed with my youthful appearance, and informed me at the start that he would expect me to make good any damage that I did to the desk in opening it. I could hardly resist the temptation to tell him that I had not lost any keys and I guessed whoever had would have to pay for any damage that was done to the desk, but, remembering in time that "A still tongue makes a wise head," without saying a word I first carefully sized up the job, then took hold and opened it as already explained.

Lock that Cannot be Opened

Mr. So-and-So turned out to be a very decent sort of a fellow once we were acquainted, and in the conversation which followed he inquired if I could not fix his desk so that it could not be so easily opened. I replied that I could and I fitted it with a lock similar to that shown in Fig. 137. This lock, as may be seen from a careful inspection of the illustration, had two small hooks or dogs that spring out from the sides of the bolt as it is shut and engage in the strike plate that is screwed to the drawer framing. The dogs are sprung out by the action of the key and cannot be moved back again without it, but, as I explained to Mr. So-and-So, the lock requires careful fitting or it will not catch properly and the lock is then no better than one with a plain bolt.

There is another feature of this lock worthy of mention and that is, it can be locked without a key. Pressure on the front of the cylinder when the bolt is down will release it and cause it to spring into place, so that it really answers the same purpose as the one shown in Fig. 136 with the added advantage that the bolt cannot be pressed back again and so the lock is not so easily opened. Quite a number of the solid-bolt drawer locks are also made with this feature and in most cases they are to be preferred.

If a person is suddenly called away he does not have to hunt for his keys and go through the motions of locking the drawer; pressure with the thumb on the front of the cylinder is all that is required.

Spring Lock with Square Bolt

I cannot call to mind an instance where it is absolutely necessary to have the lock spring shut every time the drawer or door is closed, but if you should happen upon such a case and the lock with the cylinder features of Fig. 137 does not suit, there is still another lock with a square bolt that should fill the bill. It has a striking plate as shown in Fig. 138 and a small pin which

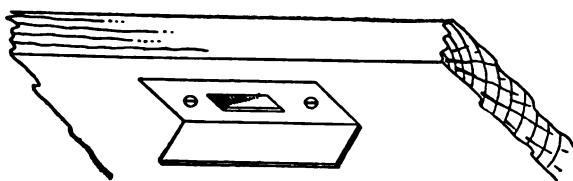


Fig. 138.—Striking Plate of a Lock Having a Square-Edged Spring Bolt.

projects from the back of the lock near the top, strikes against this plate as the drawer is closed and releases the bolt.

Another Way of Opening Locked Drawers

In all of these spring-bolt locks there is danger of locking the drawer with the keys inside of it. It appears to be a natural action for a man, after opening the drawer, to lay the keys inside while he takes up something else and then to close the drawer and spring the lock shut before thinking of the keys. The writer once made a small hardwood tool chest for a machinist friend which had a drawer in the lower portion fitted with the style of lock shown in Fig. 137. I explained the working of this lock to him and how difficult it would be to open it without spoiling the woodwork. I also cautioned him against locking his keys in the drawer. Nevertheless, when I met him a few days afterward he admitted that he had done that very thing.

“And I suppose,” said I, “that you broke the front of the chest all to pieces getting the drawer open.”

“Why no,” he replied, “I just took a short piece of hack saw blade, gripped it in a pair of pliers and sawed the bolt of the lock off with it.”

What do you know about that?

CHAPTER XII

A ROLL-TOP DESK, DESIGN AND CONSTRUCTION

THE range and variety of the carpenter's work is bounded only by his ability. It is safe to say that if he knew the construction of a tower clock he would soon find some job where he could use this information to advantage. Which is all the apology we are going to make for the subject of the present chapter.

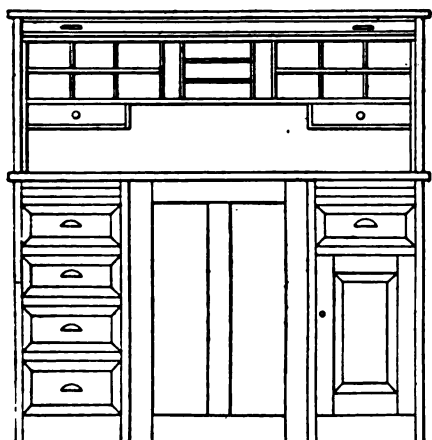


Fig. 139.—Front Elevation of Desk Showing Roll Top Open.—Scale $\frac{3}{16}$ In. to the Foot.

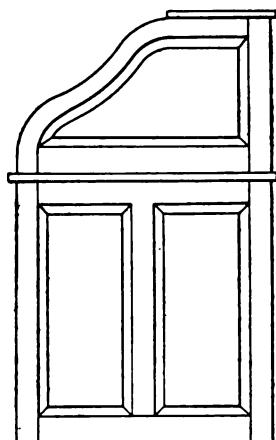


Fig. 140.—End Elevation of Desk. Scale $\frac{3}{16}$ In. to the Foot.

This job fell to the writer's lot and may some day fall to yours. If you read carefully what follows, you will be better equipped to handle it than he was at that time.

Referring to the accompanying sketches, Figs. 139 and 140 show front and end elevations of an average style of desk. It has four drawers in the left pedestal and one drawer and a book cupboard in the right. Both pedestals have also a sliding board or leaf at the top, sometimes called an "arm-rest" and some-

being beveled on the inside edges, make a panel that is sunken on both sides. The grooves in the stiles are only $\frac{1}{4}$ in. wide, but $\frac{1}{4}$ -in. material is hardly suitable for panels unless it can be obtained in the form of three-ply veneers.

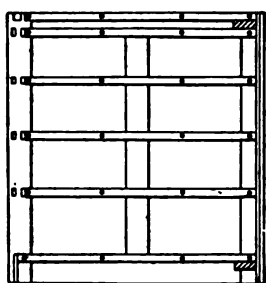


Fig. 145.—Inside of Pedestal Showing Drawer Runners and Other Details.

The style of panel which comes flush on the inside makes a little the best job because it affords a flat surface on which to fix the drawer runners. The latter are of $\frac{1}{8} \times \frac{3}{4}$ -in. material and are fixed to the sides with screws as in Fig. 145, which also shows the small mortises that receive the tenons on the ends of the drawer divisions.

An enlarged detail of one of these division strips is shown in Fig. 146. A single tenon can be used instead of the double one, but the latter makes a little the best job. The 3-in rail at the bottom of the pedestal front is fitted with a dovetail, as is also the strip above the sliding leaf at the top. After the drawer divisions are in place and these two pieces have been driven home, the front of the pedestal is locked together in a very satisfactory manner.

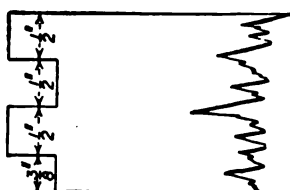


Fig. 146.—Detail of Division Between Drawers. — Scale 6 In. to the Foot.

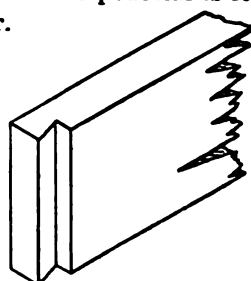


Fig. 147.—The Dovetail Used on the Bottom Rail of the Pedestal.

Dovetail for Bottom Rail

The form of dovetail used on the bottom rail is shown in Fig. 147. The top strip lying flat is fitted with the common form which is too well known to need illustrating. It is not, however, usual for desk manufacturers to put in this top piece, the more

general way being to omit this strip and allow the "arm-rest" to come directly under the desk top. When the strips are used they offer an easy method of fastening the pedestals to the top because the screws can be passed straight through the strips from the under side. They also provide a place to "plant" a small molding around under the top, if this be desired.

Book Stalls

In the pedestal containing the cupboard the unnecessary drawer slides and divisions are omitted and after the pedestal is put together the book stalls are constructed as in Fig. 148 and slipped into place. They are held in position with screws and a $\frac{1}{4}$ -in. bead or other small molding may be bradded around the front edge to hide the joint. These book stalls are usually made of pine or other soft woods.

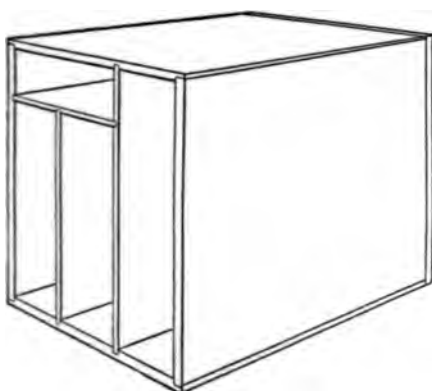


Fig. 148.—Perspective Showing Book Stalls in the Cupboard.

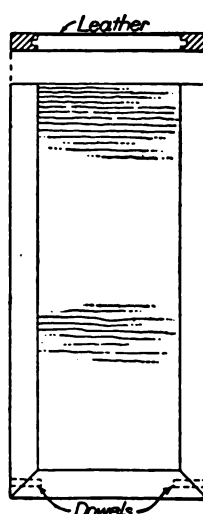


Fig. 149.—Plan and Section of Arm Rest.

Sliding Arm-Rest

The sliding arm-rest should be made as in Fig. 149, which shows it in plan and section. The grain in the center portion runs cross-ways of the board and in the desk which the writer

has in mind this center portion is of soft wood covered with imitation leather. The mitered corners of the outside rim may be held together with a hardwood dowel, which will answer the

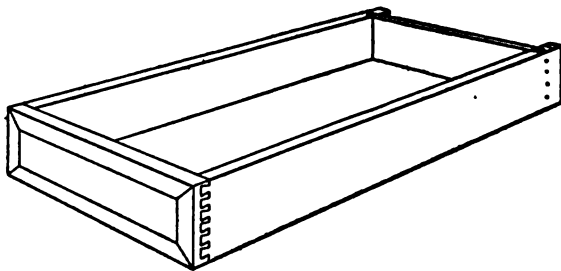


Fig. 150.—Perspective of One of the Drawers.

purpose just as well if put in after the corner has been glued and cramped together. This outer rim may be mortised and tenoned together, if so desired, in which case the front piece runs right across and carries the mortises, the sides being tenoned into it.

The Drawers

One of the drawers is shown in Fig. 150. The front is $\frac{3}{8}$ in., the sides and back $\frac{1}{2}$ in. and the bottom $\frac{3}{8}$ in. thick. All the interior woodwork is usually of soft wood, but it makes a better running drawer if hardwood is used for the sides, while the difference in cost is next to nothing. A longitudinal section through a drawer is shown in Fig. 151. The grain of the wood



Fig. 151.—Horizontal Vertical Section Through One of the Drawers.—Scale, $\frac{9}{16}$ In. to the Foot.

in the bottom should run cross-wise of the drawer in all cases, and it should be a tight fit in the groove provided for it. This is best accomplished by making the groove $\frac{1}{16}$ in. smaller and beveling the under side of the bottom to fit. The bottom is made fast to the drawer front only and left projecting a little at the back, thus allowing it to swell or shrink without splitting.

Automatic Drawer Locks

The arrangement for locking all the drawers automatically is shown in front and side elevations in Figs. 152 and 153. It consists of the piece "A," which is $1\frac{1}{4}$ to $1\frac{1}{2}$ in. square and fitted to slide easily but not loosely, in the pieces marked "B" and "C." These pieces are about 1 x 3 in. in cross section and are fixed across the back of the pedestal at the top and bottom as shown by the section lining in Fig. 155.

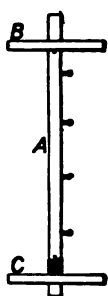


Fig. 152.—Front View of Automatic Drawer Lock.

A metal catch of the shape shown in Fig. 154 is secured to the back of each drawer and corresponding pins are fixed in the side of the piece "A" of Fig. 152. These pins may be plain pieces of stout iron



Fig. 153.—Side View of Automatic Drawer Lock.

wire or round headed screws as indicated. A coil spring is placed on the foot of the piece "A" of Fig. 152, pressing against "C" and held in place with a pin through "A." The piece "A" is also provided with a stop-pin at the top to prevent the spring raising it too far for the catch, Fig. 154,

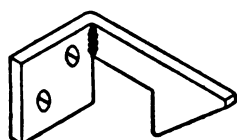


Fig. 154.—Perspective of Metal Catch for Back of Drawer Shown One-half Full Size.

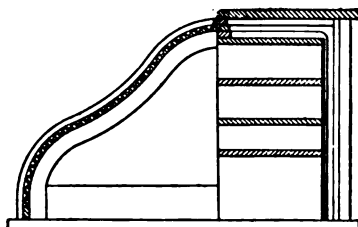


Fig. 155.—Vertical Cross Section of Upper Part of Desk.

to engage the pins. The top of the piece "A" projects upward through the desk top, behind the pigeon holes and directly in line with the groove in which the roll curtain travels. When the curtain is down or closed the spring forces "A" upward, caus-

ing the pins to engage the catches on the backs of the drawers. When the roll curtain is unlocked and pushed back it rests on the ends of the projecting pieces "A"—one in each pedestal—compressing the springs and disengaging the pins from the catches, and thus allowing the drawers to be opened. The springs can easily be made by taking a short length of steel or hard brass wire and twisting it a few turns around a cylinder of the proper size. The closer the coils are made the stiffer the spring and vice versa. The catches are made with beveled ends so that a drawer may be pushed into place and locked even after the roll-curtain has been closed.

There is another form of lock which has no springs but is only suitable for a desk made all in one piece. In it the hooks are attached to the piece "A" and engage the backs of the drawers. A short lever is attached to "A" with its free end projecting upward in the path of the roll-curtain; when the curtain is pushed back it depresses the free end of the lever and raises the piece "A," thus releasing the drawers.

Still another form of lock—not usually seen on roll-top desks—is one in which the top drawer in the pedestal locks all the others. The piece "A" is arranged exactly as in Figs. 152 and 153 but without the spring, so that the normal position of "A" is at the release with a stop pin resting on the piece "C." All the drawers are fitted with the catch shown in Fig. 154 except the top one, and this has a beveled lug projecting from the back which presses against the under side of the top pin, thus raising the piece "A" and locking all the lower drawers. To release the drawers, it is necessary to unlock the top one and draw it out a short distance.

This completes our discussion of the lower portion of the desk with the exception of the paneled board which fits in between the pedestals. As this is exactly the same as the sides of the pedestals excepting in width there is little to say regarding it unless we mention that "through" mortises may be used instead of blind ones, if they are found easier to make. Often a shallow drawer is made and fitted directly under the desk top in between the pedestals and sometimes when the drawer

is omitted a narrow strip with bracket shaped ends is fitted in its stead.

Top Portion of Desk

A cross section of the top of the desk is shown in Fig. 155. It will be best to draw the outline of this full size on a sheet of paper, sketching in the curves freehand. The paper can then be laid on top of the material to be marked and the lines transferred either by means of carbon paper or by going over the outline with a dressmaker's tracing wheel, which will reproduce the lines on the material in a series of dots. The curved front rail can be cut in one piece from a board 10 in. wide. It is joined to the stile at the back by mortise and tenon and to the rail at the bottom with two hardwood dowels, the later form of joint being the best at this place on account of "the way of the grain."

The curved groove in which the roll-curtain works is gauged from the front edge to show an equal margin. It will have to be carefully cut with chisel and router and is best cut after the side has been framed and glued together. The groove which receives the edge of the panel is cut with a chisel of the correct width in the same manner that one would cut a mortise. If one can get the use of a foot power mortising machine the groove can be cut quite easily.

The desk top, which to avoid confusion I have called the "writing surface," can either be glued up solid, or it may consist of an outside rim of hardwood properly framed and fixed together and having a soft wood center covered with imitation leather, as described for the slides in the pedestals.

The leather may be fastened in place with liquid glue, as ordinary glue sets too fast to allow of its being used for this purpose. Paperhanger's paste such as is used for hanging burlap is also good, but to the woodworker the liquid glue offers the least bother.

Veneering might be suggested for the desk top instead of solid wood, but veneering requires special knowledge and appliances and for a single job the extra work required for veneering would

more than offset the difference in price between a veneered top and one built solid.

The Roll Curtain

The roll-curtain is composed of strips $\frac{3}{8}$ in. or less in thickness by $\frac{7}{8}$ in. in width. The bottom strip is $\frac{1}{4}$ x 2 in. to provide room for the lock and hand holes. It must be reduced at the ends sufficiently to permit of its traveling in the groove and all the strips must be rounded at their edges as in Fig. 156 for the same



Fig. 156.—Partial Cross Section of Roll Curtain.—Scale, $\frac{1}{2}$ Full Size.

reason. The strips are all held together on a piece of stout canvas which is fastened to the back of them with glue and small tacks. The curtain requires no weights or other attachments—its own weight being sufficient to carry it in either direction after it has been moved past the center. It will perhaps be found to work stiff and jerky after the desk has been varnished, but if it does, rub the groove well with a cake of beeswax. The pigeon holes are made of pine, using $\frac{1}{2}$ in. for top and sides, $\frac{3}{8}$ in. for shelves and back, and $\frac{1}{4}$ in. for divisions. They are made separate from the desk and fixed in place like the book stalls in the cupboard.

The back of the top is formed of a paneled frame which is fitted to the ends in the same manner as the backs of the pedestals. The top board is fixed to the back and sides with screws that are run in at an angle from the under side. Small soft wood blocks are also fitted and glued in the angles formed by these various pieces. These blocks are an important factor in holding the various pieces rigid and square and should be used wherever they can be placed without being seen, both in the pedestals and upper portion.

After the roll-curtain is in its groove the writing surface can be fixed to the back and sides with screws from the under side.

It need only be fixed temporarily until the pedestals and top have been assembled and the working of the various parts proved correct.

The foregoing covers most of the points likely to crop up and the writer will close the subject with a few general remarks upon the way he would handle a job of this kind. The first work after a careful examination of the drawings would be to make "settingout rods" for the various parts. The next would be to make a careful and correct bill of material showing the size of every piece. Then with the material at hand commence cutting it up, starting with the largest and most important pieces and working on down to the smallest and most insignificant, which will usually take care of themselves.

Rough Lumber Preferred for Framework

The writer is supposing the desk to be made by hand and would in most cases prefer to get the material for his framework in the rough. This is in direct opposition to the advice given by most writers on this subject, but there is a reason for it.

It is absolutely impossible to have the framing flat and level and without twist unless every piece of which the framing is composed has been taken "out of wind" before it is plowed, mortised or tenoned, as the case may be. Machine-dressed lumber has just as much twist in it as rough lumber and must be straightened in the same way, the difference being that rough lumber is approximately 1 in. thick, while machined lumber does not usually run more than 13/16 in., and if there is much twist in it will have to be dressed down until too thin for use.

Do all of the dressing at one time and as far as possible follow along that line with all the other operations required. All the mortising, tenoning, plowing, etc., should be done at the one time and in its proper order. Do not fix any of the parts permanently together until you are positive all the required work has been done on them. Most of us are anxious to see how the thing is going to look, and after we have it together we sometimes find that there is a mortise to be cut in some inaccessible part or something of a like nature.

CHAPTER XIII

MAKING A DRAWING BOARD

THERE are a number of items of carpentry which, though simple enough once they are understood, are likely to puzzle the mechanic the first time he attempts them. As an instance, we may cite the making of a drawing board. Very seldom is the carpenter given anything more for his guidance than the mere size of the board, though in rare cases he may be told that it is to be grooved and cleated in the proper way. Even when a sketch or drawing of the board is provided, the workman does not always grasp the reason for the grooves in the under side of it, and at least one case has come to the writer's knowledge where the man who made the drawing was not himself sufficiently enlightened to explain it. All he could say was that drawing boards were always made that way because the grooves prevented them warping. This, of course, is only partly correct.

Every ambitious young mechanic should make a drawing board for his own use. The cost, apart from his labor, would be but a trifle, while the experience gained might at some future date be a source of satisfaction to him in a business way.

Size of Board

The sizes of drawing boards vary all the way from the dinky little 16 x 22-in. correspondence school outfit to the 16-footer of the engineer's office. A handy size for general work is 2 ft. wide by 3 ft. long. Architects and engineers have in their offices boards much larger than this supported on trestles on which they do special work, but many important building plans have been drawn on boards of about the size stated above. As the principle of construction, however, is the same the size is immaterial, so we will for our present purpose assume a board 2 ft. by 3 ft. as the size required.

Kind of Wood

Drawing boards are almost invariably made of soft white pine or sugar pine, as it is called in some sections, and here it will be well to point out that soft wood must be used, so as to permit of the easy insertion and removal of the drawing pins. Young mechanics are sometimes carried away with the idea of having an extra fine board and make one of some fancy hardwood, only to find later that for practical purposes it has been labor and material wasted.

Selecting a Board with Proper Grain

Before beginning upon the actual construction of the drawing board, it will perhaps be well for us to examine into the nature of the material that is to be used and consider the form it takes as it shrinks in drying. All woodworkers know that narrow boards are not so liable to warp as wide ones, and many mechanics are wise enough to turn the heart sides of the boards alternately up and down when gluing them together, so as to counteract this warping tendency as much as possible. Every mechanic, however, cannot tell for certain which way a board will warp when dried under natural conditions. Without going too deeply into the matter, therefore, it may be stated that all wood shrinks most in the direction of its annual rings, the effect of this shrinking being to make the board cast hollow on the side that was nearest the bark of the tree or just as if the annual rings were trying to pull themselves into a straight line.

Sap wood shrinks much more than heart wood and the effect of the shrinking upon a log cut into boards is shown somewhat exaggerated in Fig. 157 of the accompanying sketches. The pieces marked A A, if cut into boards, will shrink and warp more than any other part of the log, because they are nearly all sap wood, and the annual rings in them run

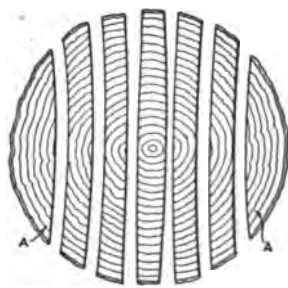


Fig. 157.—Effect of Shrinking Upon a Log Cut Into Boards.

almost parallel with the surface. The board in the center will shrink thinner on the edges where the sap wood is, but will warp scarcely at all, because the annual rings in it are at right angles with the surface. All properly quarter-sawn material has the annual rings at right angles with the surface as shown in this board, which is the reason why quarter-sawn material keeps its shape better than that sawn in the ordinary way. The *moral* is, if you want to pick a board for some particular purpose, one that will stay flat—select one with the grain running as in the central board of Fig. 157. If you wish to glue up a wide surface and cannot find boards of this character (and you will never believe how scarce they are until you commence looking for them), rip up the boards you have and arrange them as



Fig. 158.—Boards Arranged so as to have the Annual Rings Running Through the Thickness.

far as possible, so as to have the annual rings running through the thickness of the board, as shown in Fig. 158.

You will sometimes see workmen rip the material into small strips and glue it together again any old way, they seeming to have the idea that the virtue lies in cutting up their material. If the material stays in any better shape than it would in its original form, it is more by good luck than good judgment.

We are not always able to get boards that are just right for our purpose, and although we should always take advantage of the best grained pieces, where we have a pile from which to choose, it is quite possible to make almost any kind of a board lay flat by the arrangement of grooves and cleats indicated in Fig. 159, which represents an under side view of our drawing board.

Reason for Grooving the Board

Now, to explain the reason for the grooves. Some mechanics seem to have a hazy idea that the cutting of the grooves pre-

vents the board warping. This is not so, for a board if left to itself after being grooved would warp more than ever. The real function of the grooves is to weaken the board transversely, so that it may be easily held flat by the cleats that are screwed to the under side of it. In fact, when we groove a board in this way we are acting upon the same principle as when we sawkerf a molding before bending it around a curve. Supposing the board shown in Fig. 159 to be $\frac{7}{8}$ of an inch thick and the

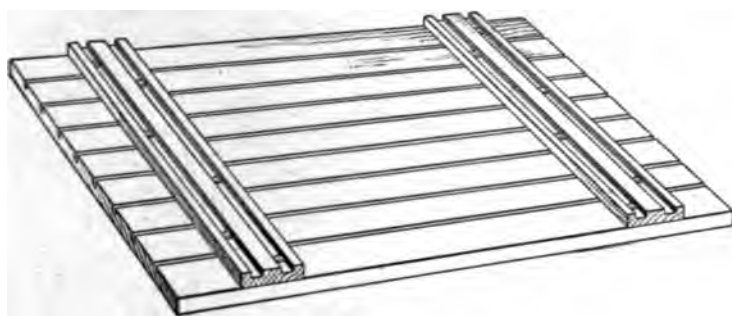


Fig. 159.—An Under-Side View of a Drawing Board.

grooves $\frac{1}{2}$ in. deep. This leaves only $\frac{3}{8}$ of an inch of wood for the cleats to hold straight, although we have practically the full strength of the board lengthwise.

Method of Fastening Cleats

The cleats shown in Fig. 159 should be of hardwood—preferably quarter-sawn oak. The screws which fasten the cleats to the board are round-headed. They have a small washer beneath the head and are passed through slotted holes, so that the drawing board may expand or shrink without changing shape or splitting. Both the screw head and the washer are sunk below the face of the cleat in a groove, so as to avoid damage to any surface upon which the board may be placed.

In Fig. 160 is shown an enlarged plan view of a corner of the board, while Fig. 161 represents a section of the same corner. Of course, it is only necessary to groove the cleats in the case of a small board like the one under consideration, which,

when in use, will be resting upon a desk or table or perhaps upon the surface of a larger drawing board. In the larger boards the screws and washers are the same, but they are not

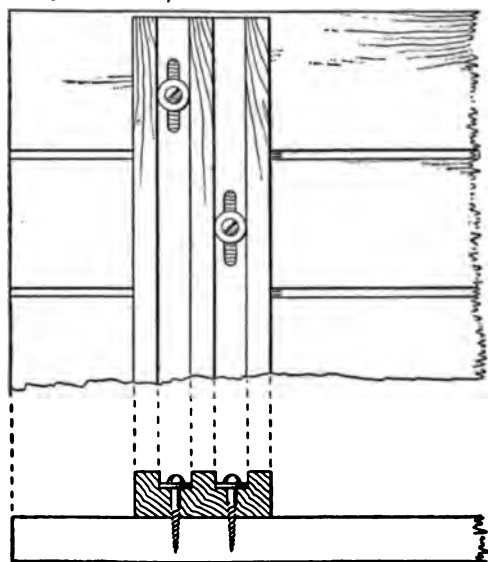


Fig. 160.—An Enlarged-Plan View of a Corner of the Drawing Board.
Fig. 161.—A Section of the Corner Shown in the Upper Part of the Drawing.

sunk beneath the surface. Large boards are sometimes fastened to stiff, heavy cleats and merely laid on their supports, their own weight keeping them in place. At other times they are fastened directly to the trestles.

Fastening Board to Trestle

In the latter case a good form of fastening to use is shown in Fig. 162. Here A is the top of the trestle to which the cleat B is first fixed with screws as shown, while CC are the round-headed screws which are passed through the slotted holes in B into the drawing board, holding everything firm. This is a capital fastening, as the board must bend the top of the trestle before it can get out of shape.

In the actual construction of the board shown in Fig. 159 it should be glued up with square joints in the usual way and the grooves cut afterwards. They can be easily made with a

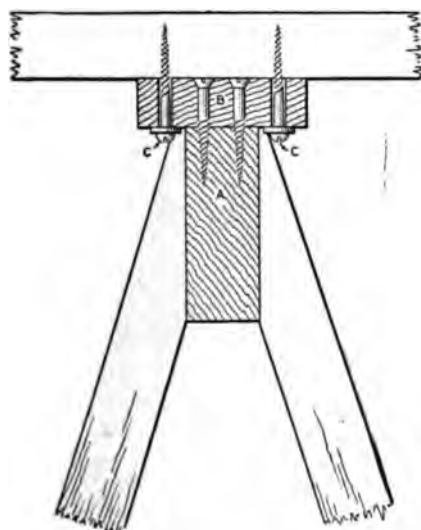


Fig. 162.—Good Method of Fastening Boards to Trestle.

45-plow plane, either by tacking down a strip for a guide or by using a fence on the plow that will drop into the grooves as they are made and thus gauge one groove from another. Where such a thing is available the grooves can be cut very easily with a circular saw.

Neither the size nor the spacing of the grooves is of special importance, but they must be deep enough and close enough together to make the board perfectly pliable, so that there will be no difficulty in making it conform to the surface of the cleats. In our present example the board being $\frac{3}{4}$ of an inch thick, the grooves are made $\frac{1}{2}$ in. deep and are spaced 3 in. apart. The under side of the board will, of course, present a neater appearance if the grooves are spaced equally, but it is better to vary the spacing than to run a groove through one of the glue joints of the board.

Squaring the Board

The under side of the board ought to be dressed before the grooves are made. After they are made and the cleats in place, turn the board over and make the top side perfectly flat and level. "Shoot" one edge of the board straight and square, gauge the other edge from it—at either end only—and treat it in the same way; then square up the ends. If the edges of the board are straight a steel square will square the end of it as good as any other method, either for a small board, such as the present one, or for one as much larger as you choose to make. In the present instance by laying the square on top of the board and keeping the tongue even with the edge of it, we can mark a knife line right across the board. With a larger board the square should be placed in the same manner and a light straight edge placed against it, as in Fig. 163, after which the knife line is marked along the edge of the straight edge.

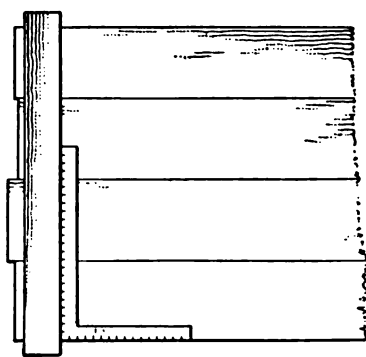


Fig. 163.—Squaring the Ends of the Drawing Board.

Regarding the foregoing method of squaring the drawing board, the writer wishes to go on record as saying that much unnecessary fuss is often raised regarding this simple matter. All that is required is a *perfectly straight* end to the board for the head of the T-square to work from, and

whether this end is at right angles to the other edges of the board or not is of no importance, excepting so far as the item of appearance is concerned. The draftsman does not use either top or bottom edge of his board from which to square his work. He draws his horizontal lines with the T-square from the left-hand end of the board and his vertical lines by means of his set squares or triangles, placing them upon the upper edge of the blade of the T-square for that purpose. The accuracy of his

angles therefore depends not upon his drawing board, but upon his drawing tools and, it may be added, his skill in using them.

Drawing boards are sometimes made with a hardwood slip running across the end to provide a smooth, easy edge for the T-square to work upon. This slip is very seldom an improvement. As its direction is across the grain of the board, provision must be made in it to allow of the board swelling and shrinking. This is done by making a number of saw kerfs in it, say about 3 in. apart or one opposite every groove in the board. These saw kerfs, of course, divide the hardwood slip into a number of small pieces and the strip must indeed have been well fastened in place if sooner or later the ends of some of these small pieces do not project slightly beyond their neighbors and spoil the working edge of the board.

Shellac Finish

Drawing boards have no finish applied to them, but are left in the white. This is an almost universal custom, as any sort of finish gives a disagreeable working surface to the board compared with the smooth unfinished pine. For his own use, however, the writer prefers to give the board just one coat of thin shellac, which is afterwards rubbed down with fine sandpaper. This does not affect the surface of the board to any appreciable extent, but it fills the pores somewhat and makes the board easier to free from dust after it has been standing idle for some time.

Making a Tee Square

A T-square for the drawing board can be bought cheap enough to bring it within the reach of every one, and as suitable wood for making a square is not always to be readily obtained, it will in most cases be better to purchase one. Where a suitable piece of wood is at hand, however, the making of a T-square is a small job. Pear tree is probably the best material to use, although cherry, mahogany or even maple may serve the purpose. The blade is the first thing to be considered, and for a 36 in. square this should be from $2\frac{1}{2}$ to 3 in. wide and $\frac{3}{32}$ of an inch thick.

To make a strip like this out of a piece of $\frac{7}{8}$ -in. material, we first gauge and dress it to the correct width, making it as straight as possible, because it is easier to make it straight before it is cut thinner. After the edges are straight and square rip the strip edgewise, cutting off a piece about $\frac{1}{4}$ of an inch thick. It will probably cast or warp a little, which is the reason why we do not cut it nearer to the finished size. Now dress this strip down to the proper thickness, planing it first one side and then the other until it is quite straight and flat.

It is easy enough to plane a thin strip such as this square blade if one knows how to do it, which is as follows: After you have worked it in the ordinary way until there is danger of hitting the bench stop or until the strip shows an inclination to buckle on you, take a piece of board with a perfectly flat surface and fasten the strip to it with a couple of brads, driven through that end of the strip which is farthest from the bench stop, so that when planing the strip you are pulling from the brads instead of pushing against them.

It is important that the board to which the strip is fastened has a flat surface, because the strip is now so thin that it will follow the shape of the board on which it rests as the plane passes over it and any irregularities in the board will be reproduced in the strip in an opposite direction. The strip should be an inch or so longer than the required finished length so that the end where the brads were driven may be cut off after the planing is done.

Straightening Edge of Thin Strip

If it ever becomes necessary to straighten the edge of a thin strip, such as this square blade, the best method is to fasten a trying plane upside down in the bench vise and draw the edge of the strip over it toward you. If the sole of the plane is true and the iron finely set a good job can be done in this way.

The head of the T-square can be $2\frac{1}{2}$ in. wide, $\frac{1}{2}$ in. thick and from 10 to 12 in. long. The making of it presents no difficulty, but it is easier to dress and straighten a piece twice this length and then cut it down afterwards.

The blade is fastened to the head of the square with glue and five screws, as represented in plan and elevation, Fig. 164. Flat head brass screws $\frac{1}{2}$ in. No. 4 are about the right size, and being so small they are very tender and in hardwood require careful driving. The holes to receive them must be of the correct size and it is necessary to make a countersinking for the heads. To avoid breaking a screw in the square and so spoiling the appearance of it, make some tests on a spare piece of the same kind of wood until you are certain of the correct size of the hole. To

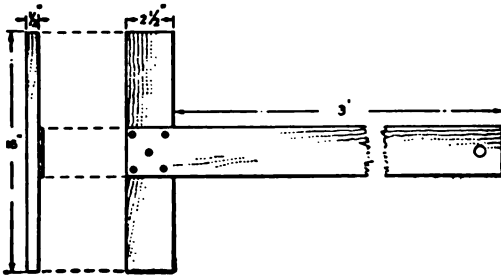


Fig. 164.—Method of Fastening the Blade to the Head of a T-Square.

fasten the blade put in the center screw first, adjust the blade carefully with the help of a good steel square and then put in the other screws. It will help some if the head, being made as before advised of twice the finished length, is not cut to correct size until the blade is square and fastened.

Many carpenters have made drawing squares with the blades sunk flush into the heads, and even with the blades mortised in. These, though more difficult to make, are not really so good as the one illustrated, because they will not permit of the triangles working close up to the end of the board.

Boring Hole in Blade Without Splitting

All that is now required to finish this square is a hole in the end of the blade by which to hang it. Many a square blade has been spoiled by splitting, whilst the workman was attempting to make this hole. It is the nose of the bit that does the splitting, so we must first make a hole—with a bradawl or automatic drill

—through the blade large enough to clear the nose of the bit. Then if we lay the blade on a small piece of wood and pass the nose of the bit through the hole provided for it into the piece of wood, the lips of the bit will cut out the remainder of the hole without any danger of splitting the blade.

CHAPTER XIV

PICTURE FRAMING AND KINDRED SUBJECTS

A KNOWLEDGE of picture framing is something that may at any time prove useful to the carpenter, and an endeavor will now be made to put forth a little general information on this interesting subject. Generally, picture framing starts in the jobbing shop with the framing of a few blue prints, public notices or work of a like character, which, when well done, often leads to something better.

Tools Required

The tools required for the work are no more than those found in the "kit" of every good woodworking mechanic, and any special skill required is to be easily obtained with a little practice. The writer has in his time framed hundreds of pictures of

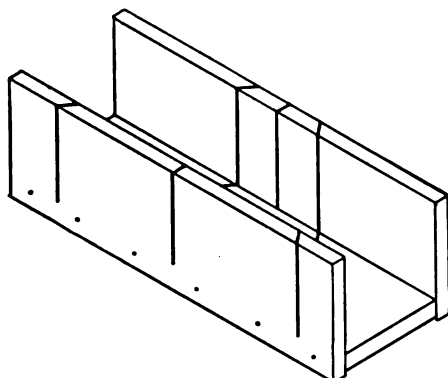


Fig. 165.—View of Wooden Miter Box.

almost every kind and size. He has never used anything more elaborate than a good iron miter box, and much of his work has been mitered in the home-made wooden article pictured in Fig. 165 of the sketches.

Most of the trouble with poor mitering has its origin in the miter box, and we shall therefore first endeavor to point out some of the faults to be found in this necessary article. The usual ones are a tendency to make it much too big and to use any old scraps of material that are of no account for anything else. The result is that though the box itself has been fairly well constructed, it will, after the saw cuts are made in it, warp or twist all out of shape, so as to be practically useless for fine mitering. It is no uncommon thing to see a mechanic construct a miter box 5 or 6 in. wide when perhaps all he has to miter is a piece of $\frac{1}{4}$ in. quarter round. His idea evidently is that it takes no longer to make a large box than a small one, and the large box may be useful later for the purpose of mitering wider molds. It generally happens, however, that when he goes to the mitering of wider moldings his miter box is either worn out or broken, and so he has bothered himself with the clumsiness of a large box for no good purpose.

Making a Miter Box

In making a miter box it is very essential that the cuts be true and at an exact angle of 45 degrees with the sides, but it is just as important that the box itself be truly and squarely made with the sides of a parallel depth and parallel one with the other before these cuts are made. Considering the small amount of material required it is as well to try and pick out pieces free from all knots and of as straight grain as possible, which are not so liable to twist out of shape after the cuts are made. Take first the piece for the bottom and plane it out of wind on the top or face side; then make one edge exactly square with this side. Gauge the other edge to the proper width and make it also square with the face side; treat the two sides in like manner, except that it will only be necessary to square the top edge of them, from which a gauge line is marked the proper inside depth of the box. After this has been done the two sides can be nailed to the bottom, using the gauge lines for placing them and allowing the rough lower edges of the sides to go where they will—whether flush with the bottom of the box or a little beyond

it. Fig. 166, which is a cross section of the box, should make all this clear.

After having proven to our satisfaction that the box is perfectly square and parallel inside, we next proceed to set out the saw cuts. These are often marked with the steel square, though a handier job can be done with the combination square that was pictured earlier in these pages. Fig. 167 shows the steel-square method. Other figures than 12 and 12 can, of course, be used, but the mechanic should be sure to make the measurements from the inside edges of the box, these being the ones that we have faced up and made parallel. The plumb marks should also be made on the inside of the box, and for accurate work all marks should be made with a knife-edge.

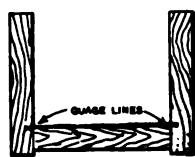


Fig. 166.—Cross Section of Miter Box, Showing Gauge Lines.

The cuts require careful sawing and should be made with the saw that is to be used in the box. Start the saw close to one side of the knife mark and be sure to keep on that side all the way down the cut. It is usually necessary to cut from both sides in order to keep the saw cuts plumb, and if one is not careful

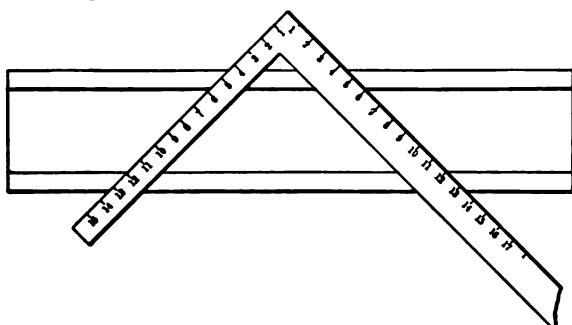


Fig. 167.—Plan View of Miter Box, Showing How the Cuts are Marked with the Steel Square.

when turning the box around he will get on the wrong side of the line. A square cut is usually added to the box, as seen in Fig. 165, but the cutting of it can be left until it is needed, because the fewer the cuts in the box the better.

A Miter Block

The miter block, Fig. 168, deserves more consideration than it usually receives from American mechanics. It is especially useful for cutting small moldings, say $1\frac{1}{2}$ in. or less in width.

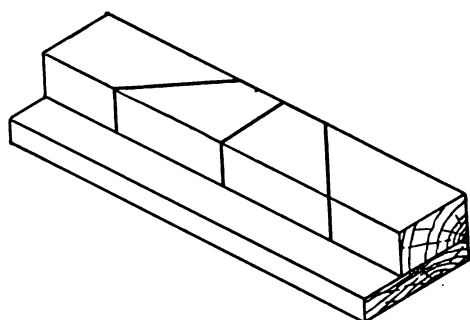


Fig. 168.—Perspective View of Miter Block.

For this purpose it is better even than the iron miter box, being smaller and handier and not requiring to be changed from one side to the other for each cut. In size it is about 1 ft. 4 in. long, 5 in. wide and $2\frac{3}{4}$ in. thick, with the rabbet about $2 \times 1\frac{3}{4}$ in. It should be made of hardwood and can be built up as shown or rabbeted out of a solid piece.

The Miter Shoot

The miter shoot in Fig. 169 is used for trimming the ends of the moldings with a plane after they have been cut with the saw, and though not indispensable, it has its uses. If the saw is in proper shape it should cut the moldings so that there will be no need for further trimming, but there is sometimes a little difficulty in getting the moldings exactly the correct length. The two opposite sides of a picture frame must be exactly similar in length if we are to have good miters, and the miter shoot is a valuable aid to this end. It should be built up as shown, being about 2 ft. 6 in. long and 9 to 12 in. wide. The rabbet should be made of a size to accommodate the plane that is to be used with it.

There are a number of different styles of picture frame cramps on the market and an almost endless variety of home-made affairs have at different times been contrived for the purpose.

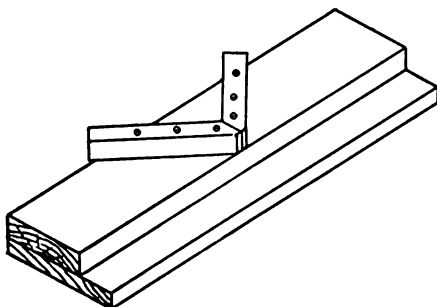


Fig. 169.—View of Miter Shoot.

They are used almost entirely by the amateur, practically all of the professional framers' work being put together and nailed in an ordinary machinist's vise.

Cutting and Nailing Frame

We will for the present concern ourselves with the professional's method. The molding is measured along the inside or rabbeted edge—never along the back edge—and cut to length. Sometimes the sight measure of the frame is given and sometimes the rabbet measure. The sight measure must always be marked on the molding in order to obtain the proper length for cutting, and twice the width of the rabbet deducted from the rabbet measure gives the sight measure. For instance, with the rabbet $\frac{1}{4}$ of an inch wide and the rabbet measure 16 x 20 in., the sight measure would be $15\frac{1}{2}$ x $19\frac{1}{2}$.

Having cut the four pieces for the frame and made sure that the opposite sides are exactly even in length, fasten one of the pieces in the vise as shown in Fig. 170, gripping it across from the back edge to the inside of the rabbet and placing a piece of cardboard or something similar in the vise to protect the back edge. Examine Fig. 170 carefully and note that the end of the rabbet at the miter comes exactly even with the side of

the jaw of the vise. This is important because when we apply the second piece the rabbet in it will rest firmly against the side of the vise jaw and one may hammer on it as hard as he pleases

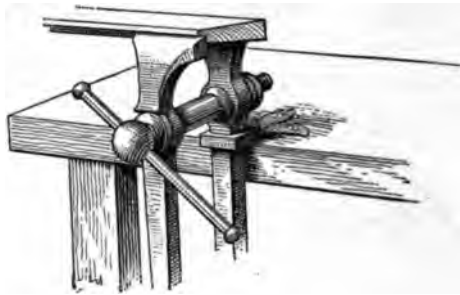


Fig. 170.—Showing How the Molding is Gripped in the Jaws of the Vise.

without moving it, so long as it is held square with the piece in the vise. Different people have watched the writer nail up a frame and then have tried to do likewise and failed, just because they did not notice this little item.

With one piece firmly fixed in the vise, place the other piece against it in the position it will occupy when finished; slide it toward the back edge of the miter about $\frac{1}{8}$ of an inch—because the nailing has a tendency to draw it forward—and bore the

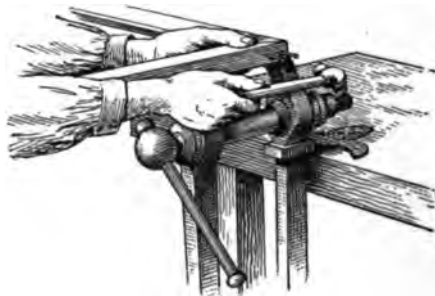


Fig. 171.—Method of Holding the Molding in the Vise While Driving the Nails.

holes for the nails right through the first piece and a little way into the other. Now take the molding apart and brush *both* edges of the miter with a little thin hot glue, being very careful

not to get any on the face of the molding. Liquid glue is worse than useless for this purpose. Place the pieces in position again and drive in the nails or brads, allowing the last few taps of the hammer to draw the molding into place until all the members intersect. Fig. 171 shows the method of holding the molding while driving the nail.

Place the other half of the frame together in this manner and then put these two halves together, using exactly the same method. It may happen that in gluing the last miter one may get some glue on the face of the molding; if so, wipe it off with a piece of cloth and a little warm water before it has time to set. Do not use the water too hot or it will be liable to take the polish off the molding.

In soft wood the holes for the nails can be made with a fine bradawl, in hardwood they should be made with the automatic drill mentioned earlier in these pages. A little soap applied to nails or screws that are to be driven into hardwood make an almost unbelievable difference in the driving of them. If the frame molding is composed of more than one piece, as, for instance, a natural wood outer frame with a gilt molding inside it, the gilt molding must be mitered and nailed up separately; then dropped into its position in the outer frame and fastened to it, care being taken that the nails or screws used do not come through to the front of the frame and spoil it.

Cleaning Glass

The frame being now completed, it may be fitted with a glass and the picture inserted. The glass will first need cleaning, which is an item of no little importance. A good way is to wash both sides of the glass with clean water and while it is still damp rub it all over with a cake of chalk or whiting. In a few moments this will be dry and the glass can be thoroughly cleaned or polished by rubbing off the dry chalk with a clean dry cloth or a crumpled newspaper. Scouring soap, such as Sapolio, used in the same manner is also good.

Trimming Picture

If the picture is the correct size it can now be dropped into place, but quite often it is necessary to trim it a little. The best way to do this is to lay the picture face up on the bench and place the frame over it in its relative position, adjusting one with the other until the appearance of the picture suits; then after marking around the rabbet of the frame, with a pencil lift the frame and trim the picture to the pencil lines.

Mounting on Stretcher

Blue prints having old associations for their owners are sometimes sent in to be framed. These will generally be more or less crumpled or creased, and to make a good job of them they should be mounted on a "stretcher" before being placed in the frame. The "stretcher" may be of soft wood from $\frac{1}{2}$ to $\frac{3}{4}$ in. in thickness and from 2 to 3 in. wide, depending upon the size of the print. It should be mitered and nailed together the same as the picture frame, of a size to fit snugly in the rabbet of the frame molding.

To mount the print it should be laid out face down on some level surface and wetted evenly all over with a sponge and water until it lies perfectly flat and pliable. Sometimes it is necessary to wet it more than once in order to secure this result. Cover the face of the stretcher frame with hot glue and hold it in position on the print, see that it is in perfect contact all around and then turn it face up and set it aside in a horizontal position to dry, when it will be found stretched as tight as a drum head and perfectly free from creases.

It is as well to lay strips of wood or something similar on the face of the blue print around the edges to insure them keeping in contact with the stretcher while the glue is setting, also one edge at least of the print should be trimmed before it is dampened in order to insure the placing of the stretcher in the correct position.

Cutting and Fixing Back Boards

With the picture or print in place, the next thing is to cut and fit the back boards. If there are only one or two pic-

tures to frame, the backs can be made from a few odds and ends of boards dressed down until they are of the required thickness. If there is much framing to do, however, it will be better to procure boards cut especially for this purpose. They are mostly used about $\frac{1}{2}$ of an inch thick, and any sawmill can make them. They should always run the short way of the frame, and can be cut to length by drawing the corner of a chisel across them on each side and then snapping them off. They are fastened in place with small brads, care being taken that when driving them we do not in any way injure the frame. The very best way is to push them into place with a small pair of pliers.

In order to make a good job, all the cracks between the boards and around the edges of the frame should now be covered with strips of paper to prevent dust getting into the picture.

These strips may be either pasted or glued—glue being given the preference by the professional, because it is at hand and dries quicker.

Cutting Cardboard Mounts

The appearance of many pictures is much improved by placing a cut-out mount between them and the picture frame, and in order to make the subject complete, a few general instructions will be presented for cutting these mounts from cardboard. The novice generally looks upon cutting beveled mounts as a difficult undertaking, but there is really nothing difficult about it, and a few minutes' practice on a spare piece of mount cardboard should give him all the confidence he requires. A wide, thin, straight edge is best for this, as it is not so liable to slip, while a 1-in. chisel ground with a fairly long bevel will be found the proper tool for doing the cutting. A beveled straight edge is the kind more generally used, with the chisel laid flat on the bevel, but one with a square edge can be made to answer if it is kept back far enough from the penciled outline of the opening to give the chisel the correct bevel. An end view of this arrangement is shown in Fig. 172.

The correct size and shape of the opening should first be marked on the cardboard and then holding the straight edge

firmly with the left hand, take the chisel in the other and with one stroke cut right through the cardboard from one corner to the next. It is necessary to make the cut right along one side

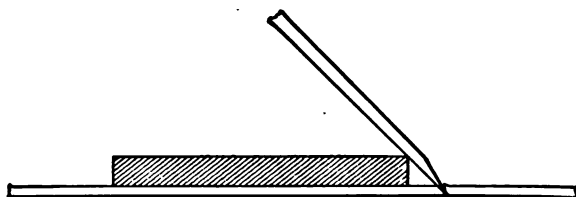


Fig. 172.—End View of Chisel and Straight Edge When Cutting Cardboard Mounts.

with one stroke if you wish to get a straight even bevel, but be careful you do not cut beyond the intersection of the lines at the corners. There is usually a little roughness at this spot after the center portion has been removed, but this is easily cleaned off with the chisel while the mount is lying flat on a spare piece of cardboard. The chisel is not held by the handle but by the blade, and only one corner of it is used for cutting, as shown in

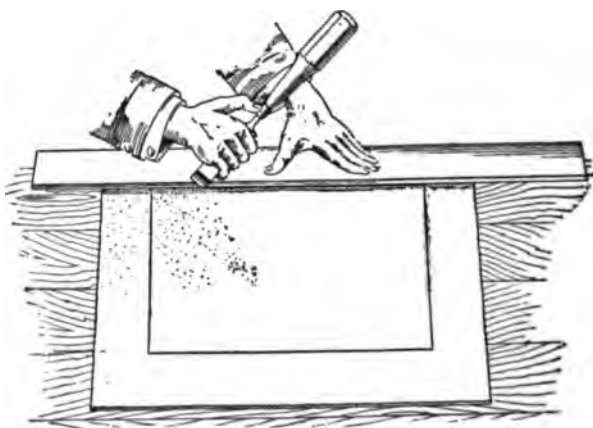


Fig. 173.—The Proper Manner of Holding Chisel in Cutting.

Fig. 173. This and the previous figure carefully studied in connection one with the other should make everything perfectly clear to even the novice.

The opening should be cut in the mount first and the mount then fitted to the frame in the same manner as mentioned for pictures. That is, the mount should be laid face up on the bench; the frame placed over it and correctly adjusted to position by measurement from the edges of the opening. A pencil line should then be run around the rabbet of the frame, marking its correct size on the mount, after which the mount should be trimmed with chisel and straight edge or with shears, as may be most convenient. The mount is sometimes arranged to show an even margin all around the picture, and sometimes so as to have the top and sides of even width and the bottom a little wider.

Means for Holding Straight edge

The foregoing method of holding the straight edge with the left hand answers well enough for small mounts, but for a large one it will be better to hold it by some mechanical means. If only one or two mounts are to be cut the straight edge can be fastened down over them with a wood screw through each end of it, but if there are many of them it will permit of quicker work if one end of the straight edge is fastened to the bench with a hinge and a cord and treadle attached to the other end. The straight edge should be so fastened that the end with the treadle projects an inch or so over the side of the bench, and then, after the cardboard is in position, by stepping on the treadle the workman has everything fast, while both hands are free to do the cutting. Of course, by this latter arrangement a thin straight edge will not answer the purpose. One should be used that is stiff enough to have a good bearing on the cardboard for its entire length. A piece of close grain hardwood, on which to do the cutting, should be used beneath the straight edge in all cases.

Sections of Simple Frame Moldings

In Figs. 174 to 177, inclusive, are shown sections of four simple frame moldings. Fig. 174 is merely a plain-rabbeted strip, but is very effective if fine figured woods, such as quar-

CHAPTER XV

CRATING FURNITURE AND HOUSEHOLD GOODS

PACKING or crating of household goods—furniture, etc.—for removal is not usually classed as carpentry work, but the jobbing shop works up a good reputation for itself by never refusing an order, and therefore looks upon everything pertaining to woodwork and a lot of things that do not pertain to woodwork as legitimate business. Many families that make a practice of moving to suburban homes for the summer months are well able and quite willing to pay for the service of a competent man to do the packing and crating, and what follows constitute a few ideas on the subject of making crates and packing cases.

A Common Mistake

In making packing cases a very common mistake is to get them much too large. Many people procure large boxes from the dry goods merchant, probably getting a large flimsy case in which millinery, for example, has been packed. They fill this box with crockery, flat-irons and preserves in glass jars and then call down maledictions upon the heads of the freight handlers because things get broken. Packing cases should be designed with a view to what is to go into them and made wherever possible of a size that can be easily handled. This, though probably using up a little more material for the job, will save money in the end.

Utilizing Dry Goods Boxes

Where dry goods boxes and such like have been procured they can be utilized by cutting them up and making them smaller, or by using the thin material of which they are composed for intermediate slats on the sides of other crates. The best way to take them to pieces is to saw through the sides close to the ends, thus wasting about an inch of each end of the sides, but obviating the chance of splitting, which you are almost certain to do if you

try to knock them apart in the usual way. After the sides have been cut the small pieces can be knocked from the ends and the nails withdrawn, with the result that you have all of the boards of the original case in as good condition as ever, excepting that the sides are an inch or so shorter than they originally were.

Making Packing Cases

A packing case is a simple thing to make, but being usually constructed of narrow boards it is often necessary to use cleats at the corners of it. Inexperienced workmen frequently make the

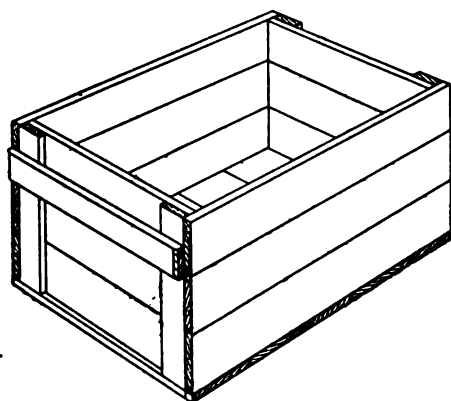


Fig. 187.—Proper Way of Using Cleats at the Corners of Boxes

mistake of putting these cleats on the inside of the case. The proper way of making the case is shown in Fig. 187. The piece nailed across the cleats at the ends as shown not only serves for a handle, but in many cases prevents the freight handlers standing the package on end. The boards in the bottom of the case are put on the short way of it and the top can be fixed in the same manner, or it may be made up in the form of a lid with the boards running lengthwise and two cleats fastened across them to keep them together. These cleats also should be on the outside.

Packing cases will serve us for all of the smaller household goods, such as crockery, cooking utensils, books, etc., but we must be careful not to mix heavy with light and fragile articles; to

- wrap all breakables separately with paper, straw, excelsior or something which will answer a similar purpose, and to pack the case so full that no amount of turning end over end will move its contents. The larger pieces of furniture, with the exception of the piano, it will be more economical to crate.

Casing a Piano

A case for the piano can usually be procured from the nearest dealer and this will be a much cheaper operation than making one. With the case secured, the crating of the piano simply amounts to covering it with cloths to keep out the dust and moving it into its case. It is fastened in place with two coach or lag screws, which are passed through holes provided for them in the back of the case. Notice where the screws were formerly

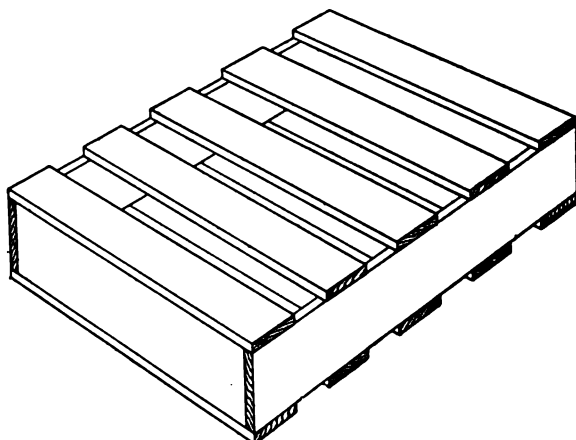


Fig. 188.—One Form of Crate.

fixed in the back of the piano as it came crated from the factory, and if the holes in the case do not suit, bore two new ones.

Making Crates

Although the shapes and sizes of crates vary considerably they are all made on one general principle, which is illustrated in Figs. 188 and 189. If these sketches are carefully studied it

will be perceived that Fig. 189 is constructed in the same manner as Fig. 188, but because of its greater depth the ends and sides are made of slats instead of being made solid.

Material for crating, where it is specially ordered, should be about $\frac{3}{4}$ x 3 in. or $\frac{3}{4}$ x 4 in., and crates with solid ends and sides, as in Fig. 188, are not usually made more than 4 in. deep. They are used for packing flat articles, such as pictures or the heavy glass shelves now commonly found in the more expensive china closets of the modern dining-room. Bass wood was at one time the wood par excellence for crating purposes, but it has now become too scarce and expensive and a common grade of spruce generally takes its place.

The most important thing about making a crate to fit a given package or article is to know exactly what you are going to do

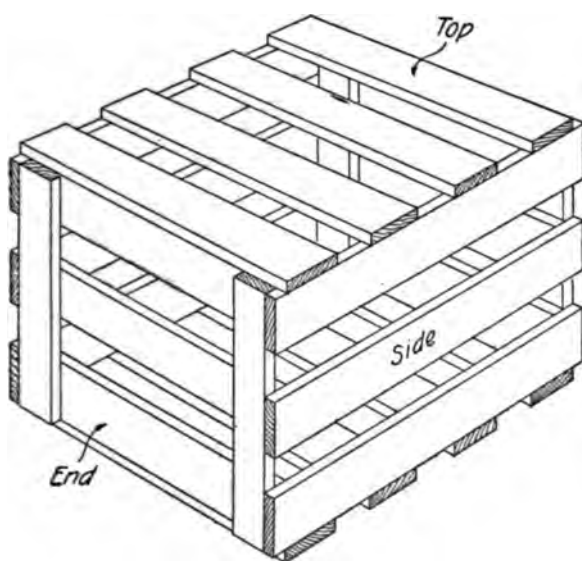


Fig. 180.—Another Style of Crate.

before commencing to cut your material. With the idea of Fig. 189 in your mind's eye this would be easy. Make the ends of the crate first and note that they must be just as high and

just as wide as the package, with perhaps a small allowance for a wad of paper or burlap to prevent chafing. After the ends are made cut the sides four times the thickness of the material longer than the package: that is, suppose the package is 3 ft. 10 in. and the crating material $\frac{1}{2}$ in. thick, cut the sides of the crate 3 ft. 10 in. — $3\frac{1}{2}$ in. = 4 ft. $1\frac{1}{2}$ in. Nail the sides on to the ends and then cut the top and bottom slats twice the thickness of the material longer than the package is wide, or so that they will nail on flush with the side slats as shown in the sketches. End, top and side have been marked on the crate in Fig. 189, so as to give the reader every help to understand the foregoing instructions. Braces are sometimes added to the crate shown in Fig. 189, but only when it is unusually large or when it is to contain some extra heavy article, such as a stove.

Handling "Knock Down" Furniture

Having discussed the making of the crates and packing cases, we will now endeavor to give some hints as to how they should be used. Much of our present-day furniture is made "knock down"; that is, so that it may be easily taken to pieces, which style takes a lower freight rate when shipping it from the factory to the retailer, and though the householder seldom makes any attempt to take his furniture to pieces the carpenter need not be so timid. He therefore looks over the various articles of furniture and takes to pieces those that will permit of it, putting the legs and top of the dining-room table in separate crates and so on.

Removable Hardware

Right here is a good place to remark that practically all furniture casters are fitted loose and should be removed. They should be packed in a small box along with the picture hooks and other removable hardware, such as the screws for holding the furniture parts together, etc. Where there are different sizes and shapes of casters they are best tied in sets and marked with a tag showing to which article they belong. The screws for each separate article can be sealed in an envelope and the latter marked, show-

ing to which article the screws belong. These precautions are taken not because of the intrinsic value of the screws, but because of the time this method will save when putting the furniture together again.

Crating Mirrors and Pictures

The mirrors of the dressers should be removed and crated separately. The dressers can be crated in a modification of Fig. 189, while two of the mirrors could be crated together in a box like that shown in Fig. 188. They should be placed in the crate with the glass side in and should be held in position with screws passed through the slats of the crate into the back of them as indicated in Fig. 190. The crate should be deep enough to allow of a space of at least an inch between the two mirrors. The top portions of sideboards and buffets are also removable, but it is sometimes more economical to crate them in their entirety than to take them to pieces and to make two crates for them. This is something the packer must decide for himself, being governed altogether by conditions.

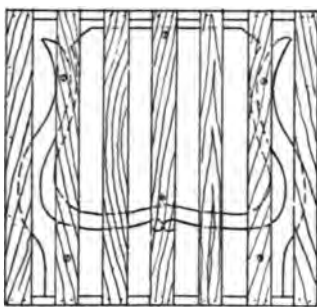


Fig. 190.—Crate for Mirrors.

Wooden bedsteads can be crated, two headboards in one crate and two footboards in another. Iron and brass bedsteads can be wrapped and crated or simply wrapped, care being taken that the wrappings are heavy and properly done. Mattresses can be rolled, covered with burlap and tied with cord. Bed springs do not require either wrapping or crating.

Pictures can be placed two in a crate as described for the mirrors of dressers, while small ones can be fixed face to face and back to back in a packing case with a wad of filling material between them at each corner. Be sure to fix them firmly and allow for the case being turned end over end. Afterward you may mark it

"THIS SIDE UP WITH CARE"

if you choose, but fix it so that turning it over will not affect its contents. Books should be packed in boxes: and in this connection remember that books are heavy things and lie close together. A box 12 in. deep, 16 in. wide and 34 in. long, inside measurement, when properly filled with books will weigh close to 200 lbs.

Packing Crockery

Barrels make the best packages for crockery and glassware. Use plenty of straw, excelsior or other filling material. Pack the barrel tight and full and head it up in the proper way. To do this loosen the top hoops until the head can be dropped into place, then as the hoops are tightened again lap the head one way or the other until it fits correctly in the groove provided for it. The ease or difficulty of this operation will depend somewhat on the skill which has been shown in correctly filling a barrel.

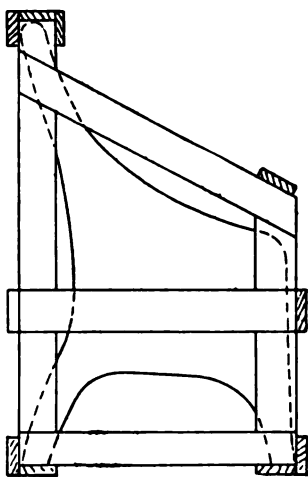


Fig. 191.—Crate for an Easy Chair.

Crating an Easy Chair

We have attempted to show in Fig. 191 how an irregularly shaped article, such as an easy chair, for example, can be crated. The chair should be well covered with burlap and the crate for it does not need as many side slats as for some other articles of furniture. In this direction there is an opportunity for the packer to show his judgment.

CHAPTER XVI

CURVED WORK: SAW KERFING, ETC.

SAW kerfing a board or molding in order to bend it around a curved surface is a scheme that has little to commend it. There are a few cases where it is permissible, but it is all too frequently used where it has no business. No matter how well it is done, the finished work has neither strength nor neatness of appearance, and although considered by some a cheap method it rarely is so because the amount of time and material wasted on a job of this kind would often more than pay for stuff sawn and worked to the proper curve from a solid piece.

With this, however, the workman has little to do. Whether he shall saw kerf or not is generally decided for him by the "powers that be," and as long as buildings are erected with curved forms or spaces in them just so long are we likely to see the woodwork disfigured with saw kerfs.

Method of Spacing Saw Kerfs

The method of finding the distance between saw kerfs which will allow the material to bend to the curve required is illustrated in Fig. 192. On the floor, bench top or other convenient place mark a straight line. On this line set off a distance equal to the radius of the curve around which the material is to be bent as A-B. With the saw intended to be used for the kerfing,



Fig. 192.—Method of Finding Distance Between Saw Kerfs.

make a trial saw kerf in the board about as deep as it is thought the kerfs ought to be. Stand the board over the line with the saw kerf at one of the radius marks, as for example at A, and

while keeping the main portion of the board even with the line force in the other end of it until the saw kerf is closed. At B measure the distance the board has moved in from the line, which distance will give the spacing between saw kerfs.

Another Method

Where the board is extra large or awkward to handle we may arrive at the same result by a somewhat different method. Make a trial saw kerf in the board as before, mark the length of the radius of the curve on the board, measuring from the saw kerf toward one end, and lay the board, saw kerf up, on the bench, placing a small block of wood beneath the board at or near the radius mark. Force the other portion of the board flat on the bench; adjust the block of wood backward or forward, up or

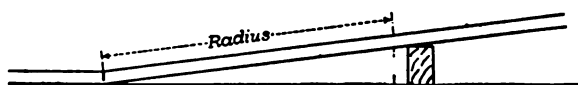


Fig. 193.—Another Method of Finding Distance Between Saw Kerfs.

down as the case may be until the saw kerf is closed; then measure the distance from the radius mark to the bench, which is the distance between saw kerfs the same as before. A glance at Fig. 193 will make the foregoing perfectly clear.

This is an old and fairly well-known rule. The writer learned it more years ago than he cares to think about and has seen it described and illustrated since then many times. There are writers on the subject who advise using a small strip of the same thickness of stuff instead of the board itself, but this is a method liable to error. The small strip is, of course, much easier to manipulate and the workman making use of it may find when he comes to the wide board that his saw kerfs are too far apart. This will not be because his spacing is not correct according to rule, but because he is not able to handle the wide board as easily as the narrow strip.

A strip of 1 in. square section can be bent—without saw kerfing—to a sharper curve than can a 1 by 10 in. board under the same conditions and this for more than one reason. There are

more imperfections in the board than in the strip; it cannot be nailed as well, and one pair of human hands is neither large enough nor strong enough to coax the board into position as they can coax the strip.

The Item of Nailing

The matter of nailing is an item that must not be overlooked in work of this kind. In bending a $\frac{3}{4}$ in. quarter-round molding to a curve we may drive a nail into it every 10 in. or even closer, but if in bending a 10 in. board to the same curve we were to drive 12 nails into it for every foot of its length the boss would be very apt to say: "Huh! You'd ought to been a shoemaker."

"Rule of Thumb" Method

Rules for saw kerfing need mixing with a certain amount of common sense before they are fit to use, and experience and handy manipulation will in most cases produce better results than a too close observance of any of these rules. One must not forget that once a board is saw kerfed all the natural spring is taken out of the material and the board will only bend at the saw kerfs; or, to put it in other words, the board being weakest at the saw kerfs will bend there, and the portion between each two saw kerfs will remain as straight as it ever was. Remembering this, try a rule for saw kerfing that the writer has used with some success. Lay the edge of the rule or steel square against the

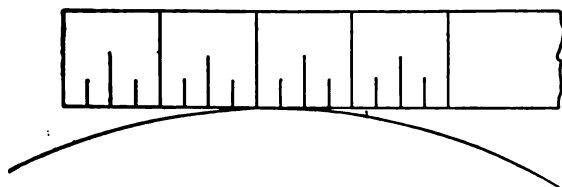


Fig. 194.—Still Another Method of Finding Distance Between Saw Kerfs.

curved surface and observe what length of it appears to be straight or flat. Use this distance for the spacing of the saw kerfs.

Theoretically there is no flat spot of any determinable length on the circumference of a circle, but for practical purposes take a look at Fig. 194. The curve here was struck with a radius of 6 in. and the portion of rule shown resting against it was drawn half full size. To the average eyesight the rule appears to touch the curve for at least $\frac{1}{4}$ in. of its length. Now, if we suppose the curve to be of 6 ft. radius instead of 6 in. and the divisions on the rule to be feet instead of inches the flat spot on the curve would then be 3 in. long, and, as already stated, would be the proper distance to space the saw kerfs.

It may be observed in passing that, although it may frequently be necessary to cut the kerfs much closer together than this, it will seldom be necessary to cut them much farther apart. When any rule shows the saw kerfs more than 3 or 4 in. apart on a $\frac{7}{8}$ -in. board, the board itself if of clear material can usually be bent to the curve without saw kerfing.

Spacing Saw Kerfs for Irregular Curve

Sometimes the curve is an irregular one having a number of radii. In such a case it is usually best to find how close the saw kerfs are needed for the sharpest portion of the curve and then space them all equally. If the saw kerfs show, the equal spacing looks the best even if they do not quite close up. If the saw kerfs do not show, the equal spacing requires the less figuring.

A very important consideration in saw kerfing is to have all the saw kerfs of the same depth, for in bending a board the strain will run to the weakest point, which is, of course, the deepest saw kerf, and great care must be exercised to prevent a fracture. There are two methods of getting the saw kerfs uniform in depth. One is to gauge the edges of the board and saw to the lines. The other is to fix a stop or gauge on the saw that will prevent it cutting beyond a certain depth. Of the two methods the second is the better.

Cutting a Molding Round a Curve

In Fig. 195 is shown the method of cutting a molding round a curve that is in some cases an improvement on saw kerfing. The

molding is cut into short lengths with the lines of the joints radiating from the center of the circle of which the curve is a part; the joints are carefully fitted and glued and after the glue is set the extreme angles of the joints are rubbed down with sandpaper. All pieces should, of course, be of equal length, which length may be found as described in connection with Fig. 194.

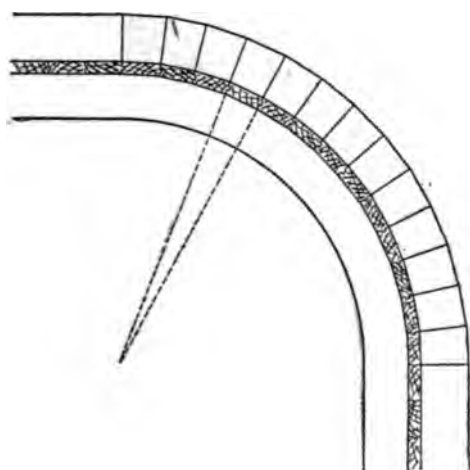


Fig. 195.—Method of Cutting a Molding Around a Curve.

Fig. 195 is supposed to be the plan of a round-cornered partition wall covered on the outside with 3-in. tongued, grooved and beaded sheathing and having a wide wooden molding for a cornice. In this case the proper length to cut the pieces of molding is easily decided. The sheathing gives the corner a number of 3-in. facets so that 3 in. is then the proper length for the short side of our molding and the joints come in line each time with the joints of the sheathing. The base, chair rail and the picture molding are applied in the same manner and the finished work has a much better appearance than might be supposed. This is a fairly good method for running an outside cornice around a circular tower, and if the work is some distance above the ground it will take sharp eyes to see that the molding has not been cut and worked from the solid.

Bending with Grooves and Keys

In order to make the subject complete we will now examine some other methods of bending. It will be seen from Fig. 196 that grooves are cut instead of saw kerfs and then the material

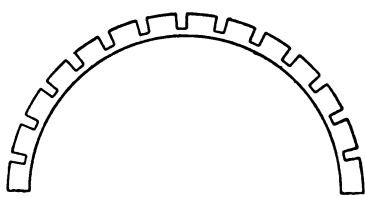


Fig. 196.—Cutting Grooves Instead of Saw Kerfs for Bending.

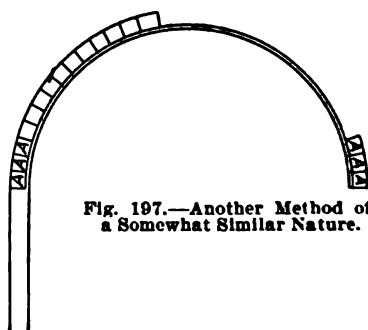


Fig. 197.—Another Method of a Somewhat Similar Nature.

is bent over a temporary form of the proper curvature and well-fitted wedges or keys are glued into the grooves. The distance for spacing the grooves may be found as described for saw kerfs and a strip of canvas or a thin veneer glued over the convex surface will materially strengthen the work.

Bending with Staves, or Lagging

Another method is represented in Fig. 197. Here the thickness of material is reduced to that of a veneer which will bend easily to the required curve, and it is then bent over a form as previously described, the thickness being filled out by gluing on the staves marked "A-A-A." Sometimes instead of staves segmental pieces are used for the backing and the reader will easily understand that the backing may apply to either the convex or concave surface of the curve as required.

Bending a Bull-nose Riser

The foregoing method of bending is often used in stair-building and a variation of it is shown in Fig. 198, which illustrates the bending of a riser round the end of a bull-nose step. The block A is made the full height of the riser and is usually com-

posed of three pieces of wood with the grain crossing at right angles. In Fig. 199 is shown the method of putting it together.

Both the block and the riser are given a coat of good hot

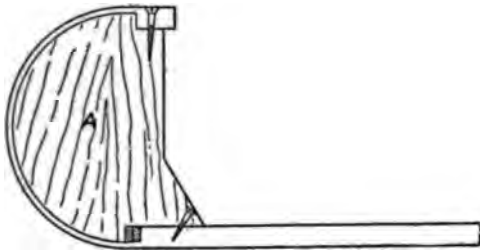


Fig. 198.—Method of Bending a Stair Riser Around the End of a Bull Nose Step.

glue; one end is fastened as shown and the block is then rolled over the riser, pressing and squeezing out as much of the glue as possible, until it assumes the position shown in Fig. 198, when the two fox wedges should be driven by an assistant, fetching everything up tight.

Laminated Curves

Another method of bending is to use several thin pieces to make up the required thickness, sometimes gluing them to shape over a form but more often fastening them directly in place. Take, for instance, the bending of a plain base board round a

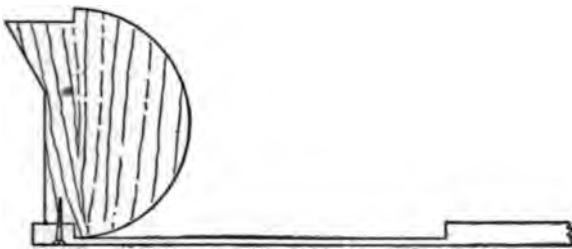


Fig. 199.—The Method of Putting the Work Together.

circular bay. While it might be impossible to bend a $\frac{3}{4}$ -in. board to the required curve perhaps two pieces, each $\frac{3}{8}$ of an inch thick, or three pieces $\frac{1}{4}$ of an inch thick would bend easily.

A friend of the writer some time ago met with a job of this kind. The base $\frac{1}{2}$ in. and in this case ran around the dome of a large public building and it was suggested to the foreman that two pieces of $\frac{1}{4}$ -in. stuff would easily bend around the curve and would be as cheap as kerfing the $\frac{1}{2}$ -in. board, while giving a very much better appearance when completed. The $\frac{1}{4}$ -in. material was procured and the foreman stood by watching while two or three pieces were applied. He then said suddenly: "I know something that will beat that: just put out every foot or so with a piece of $\frac{1}{4}$ -in. stuff but bend only one piece around. In that way we will save half the material." Pretty cheap, eh?

Enough $\frac{1}{4}$ -in. material had been ordered to do the job properly and what was saved $\frac{1}{2}$ lay kicking around under foot until it was hardly fit to burn.

The reader will say, "Two $\frac{1}{4}$ -in. pieces will not make $\frac{1}{2}$ in." We are coming to that.

The base had a molding at the top somewhat as shown in



FIG. 290.—
SPLITTING
MOLDING
AT TOP
OF BASE

Fig. 290. This was split with a fine rip saw as indicated by the dotted lines and put into place, a piece at a time, just as the base had been. If the base had been full $\frac{1}{2}$ in. thick the molding would have been too thin by the amount of the two saw kerfs.

Yes, sure. I know this style of base isn't used nowadays, but this wasn't a new job. It was an alteration to an old one.

The idea of splitting a molding up as described answers very well in painted work, but it is hardly the thing for woodwork that is to be finished natural.

The writer has heard of moldings being prepared this way in the mill: that is, several thin strips of wood are clamped together and run through the molder in such a manner that the molding is formed of a number of separate pieces which are bent and fastened in place one at a time. This makes a neater job than what is done afterwards, but if all the material is to be finished in the mill, it would be better to cut the molding with the shaper.

Bending by Steaming

Bending wood by steaming, though often resorted to by the furniture maker and the carriage builder, is little used in house work. There are several reasons for this—lack of steaming facilities, the necessity of getting the material fastened into place immediately after taking it from the steam box, and the fact that there are but few woods used by the house carpenter that lend themselves readily to this method of bending. Material of small size can sometimes be bent after having been thoroughly soaked in boiling water, but this, however, is not steaming, and for larger material live steam under pressure must be used. The larger the material the greater the pressure required so as to soak it through in the shortest possible time. This is not because of the time saved in the steaming but because the steam has a deteriorating or dissolving effect upon the outer fibers of the wood where it is subjected to it for any considerable time.

A temporary steam box can be made of 2-in. plank firmly fastened together with one end removable for access to the interior. Nearly all steamed work is bent into shape over forms made for the purpose. It is usually best to have the forms of a sharper curve than is actually required in the finished work. In factories that do this kind of work the material is usually cut to the proper length before steaming, but wherever possible it will be better for the novice to have his material a little long, as the extra length affords better leverage for the bending and can easily be cut off afterward.

Curved Wainscoting

The writer will now describe a rather puzzling piece of work, which is done in a peculiar manner. Referring to the plan of the building, it represents a partial plan and section of an office building. The wainscoting consists of framing panels, and the puzzling part is the diagonal sheathing that was made to be attached to the

ing in the corner panels, but this he would not do, claiming that the contractor knew of these corners when he made his estimate, and that vertical sheathing in place of diagonal at that point

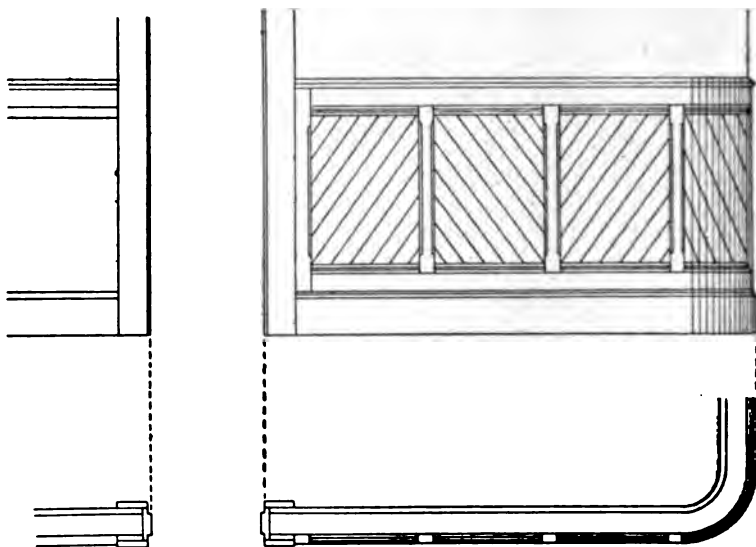


Fig. 201.—Partial Plan and Elevation of Wall of Corridor.

would prove to every later observer of the work that the vertical sheathing was there because the diagonal had been beyond the builder's capabilities.

We executed the job as follows: A number of vertical strips or staves were glued together, as shown in Fig. 202, forming a panel of the correct size. The outside face of the panel was dressed to the proper curve, as shown by the dotted lines, and V-shaped grooves to correspond with the V-joints in the outer panels were cut diagonally across the face of it with a carving tool.

There were a number of these curved corners on the different floors of the building, some of them being smaller than the one here illustrated. For the small ones we tried steaming and bending a single board, instead of gluing up staves, but the built-up panel gave the best satisfaction, all things considered.

Cutting Diagonal Panels

There was another thing in this job worthy of comment, and that was the cutting of the diagonal sheathing. The usual way of doing this work is to cut the ends of the boards at an angle of 45 deg., starting with a full width piece in one corner and letting the last piece finish whatever width it will. The architect objected to this method and decided the boards must run as

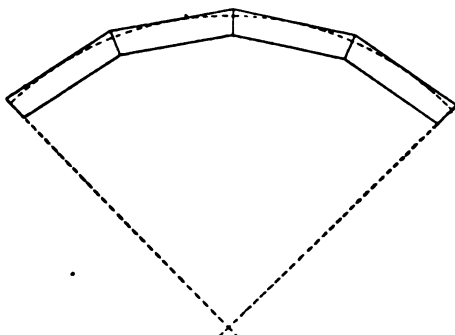


Fig. 202.—Showing How Panel was Glued Together.

shown in Fig. 201, which indicates the longest joint running from corner to corner of the panel, and the two small pieces in the opposite corners both of a size. This, of course, means that the two ends of a board were cut different bevels; also that each different width of panel altered the cuts, and some little time and material were wasted in getting these just right.

As shown in Fig. 201, the stiles of the paneling were stop-chamfered on their edges, and had a molding cut in between them at the top and bottom rail. This mold caused most of the trouble, as it altered the shape of the panel and brought the longest joint away from the corners of the framing.

Of course, there is nothing very difficult in cutting the panels this way, except when we compare this method with the usual one of running the boards all at an angle of 45 deg., in which case the extra time required amounts to quite an item. Different methods were used by the different workmen, but the scheme which worked best of all was to clamp a number of full-length

boards together on a couple of saw horses, and then to mark the shape of the required panel on them by the aid of a skeleton template. The template was made of four strips of wood with a couple of braces to keep it square, and as the panels varied in width only, one side of the template being made adjustable, would give any size of panel desired.

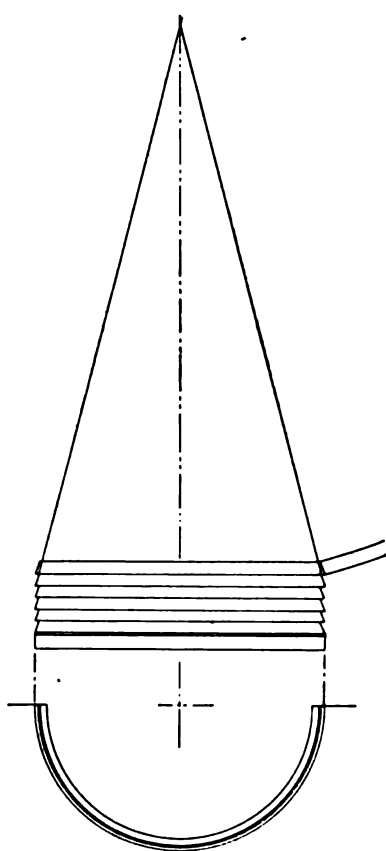


Fig. 203.—Method of Obtaining Radius of Curve for Beveled Siding.

Beveled Siding on Circular Tower

For another item of circular work take the matter of putting beveled siding on a circular tower or semicircular bay window. When doing this it is necessary to cut the lower edges of the siding to a convex curve in order to have them show horizontal lines when they are in place. The method of obtaining this curve is well known and has been before described, but in order to make this subject complete it is again illustrated in Fig. 203, which shows the plan and partial elevation of a semicircular bay window. The line of the back surface of one row of siding is prolonged upward until it intersects the center or axial line of the window; or, what is the same thing, lines may be prolonged from the back of

the same row of siding on each side of the circle, and the point where they intersect will give the length of the radius of the

curve, to which the lower edge of the siding must be cut, as shown in the sketch.

The foregoing is the correct geometrical method and the one usually described by writers on this subject, although it is seldom the most convenient to apply. The present writer has some doubts as to whether it has ever been actually used in practice. As it will in nearly all cases be next to impossible to make the drawing full size, it must be correctly drawn to some convenient scale, and the length of the radius rod required is liable to surprise any one who has never given the matter study.

Length of the Radius Rod

In order that the reader may obtain some idea of how long the rod will be, the writer will explain a method of obtaining the length of it that he has never before seen described. By this he does not mean to intimate that it has never been used or thought of before, as it is a method obvious to any one who has ever

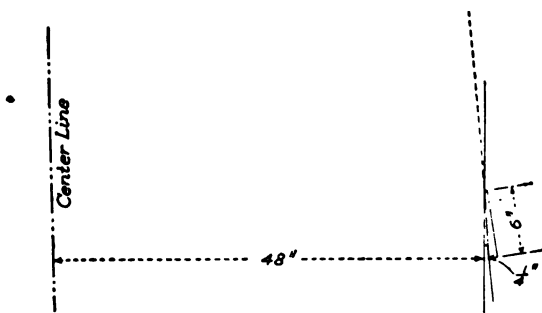


Fig. 204.—Diagram Illustrating Another Method of Obtaining Radius of Curve for Beveled Siding.

figured the length of a common rafter by first finding the length for one foot run and then multiplying this length by the number of feet in the run of the rafter. The method is similar in both cases, and is illustrated in Fig. 204, where we see that for every $\frac{1}{4}$ in. of the short radius we get 6 in. as the length of the long radius, or for every $\frac{1}{4}$ in. run, 6 in. as the true length of the common rafter. A simple sum in multiplication will show us that under the conditions pictured in Fig. 204 the full length of

the radius rod will equal 2 feet for every 1 in. of run, or 96 ft. To get this exactly correct the $\frac{1}{4}$ in. on the outside of the studding must be added, making a total of 96 ft. 6 in. for the full length of the rod. Try and draw this to scale and you will see what the writer means when he says that he doubts if it has ever been actually used in practice.

A careful examination of Fig. 204 will show everything quite clearly but it will probably be as well to point out that 6 in. is the width of the siding and $\frac{1}{4}$ in. is the amount it is held from the perpendicular by the thickness of the course of siding immediately beneath it. These two measurements and the length of the radius of the window must, of course, be obtained from the actual conditions of each individual case. In practice all the figures, including the length of the rod, can be obtained without the aid of a drawing.

A More Practical Method



Fig. 205.—Section of Siding with Strip Fastened on Back.

To make and use a rod 96 ft. 6 in. long would be the largest part of the work in connection with the siding of this window, so we will now examine a more practical method. Take a piece of siding and to the lower edge of it on the back side tack a strip of wood equal in thickness to that portion of the siding which is covered by the "lap," as shown in section Fig. 205. Bend this prepared piece of siding around the curve, keeping the ends level, and scribe a horizontal line on the lower edge of it, working from the upper edge of the base board or any other level line on the window surface. This piece of siding can then be cut to the line and used as a pattern for marking the others.

Now, after all this has been done we must not overlook the fact that in cutting the siding to a curve we will be making the ends of each piece thinner than the center, and the nearer we cut to the upper edge of the siding the thinner will be the ends. If too much is cut off, every joint in the circular

siding will show hollow, and there are, no doubt, many instances where the hollows make the siding look worse than it would have done if put on without any cutting at all.

Rabbeted Siding Best for this Purpose

The reader will realize that it is the shape of the siding which makes this cutting necessary. If the siding were rabbeted so that the back of it would lay flat on the curved surface it could be put on in straight pieces. In this latter case the surface to which the siding is applied is cylindrical, and in the other it is conical. Evidently then the easiest and best solution of the problem is to use for the circular window a rabbeted siding, which when in place will have the same appearance as the beveled siding on the straight portions of the work.

If there is much needed it can be made at the mill, but for a few pieces it is no trick at all to make it by hand out of clear material with a Stanley plow and a good sharp draw knife.

And now, just a word of caution. In putting on this rabbeted siding see that your first piece is straight, and be sure and get this first piece on level. The writer remembers an instance where rabbeted red-wood siding of the section shown in Fig. 206 was being put on a semicircular window. The men doing the work were having a lot of trouble with it, as the top edge of each piece would persist in buckling out from the studs. Nailing the top edge to draw it back invariably split the siding, and after two or three pieces had been split the foreman was consulted. He first attempted to put on a piece, and having failed, started to examine the siding that was laying on the saw horses. Every piece of it was concave on the lower edge. This at once explained the matter, for starting at one end of the piece of siding and nailing it, the other end would be hanging away below its proper position, and bringing it up to line would buckle the top edge out of place.



Fig. 206.—Section of Rabbeted and Molded Siding Full Size.

The men had turned over 2000 or 3000 ft. of the siding in order to get clear straight-grained pieces that would bend easily, but had overlooked the fact that these pieces should also be pretty nearly straight. This point was explained to them by the foreman, and another start was made with some pieces that were slightly convex. This convexity caused them to hug the studs at their upper edges, and no further trouble was experienced.

A Suggestion

Seeing, as a general thing, that there are only a few long pieces of siding needed for a bay window (most of the surface being made up of sashes), it might be possible out of a good-sized pile of siding to pick enough pieces of the proper curve to do the job. Suppose you try it.

CHAPTER XVII

CONTRACTORS' LADDERS

THE writer offers no apology for the subject of the present chapter, for ladders are important items of the carpenter's equipment and in some parts of the country the only way he is sure of getting good ones is for him to make his own.

Best Wood for the Purpose

The best wood for ladder sides is straight-grained Oregon pine; although clear straight-grained spruce runs it a close second, but straight-grained spruce is, in most cases, harder to obtain. White oak, white ash, hickory, in fact, almost any of the hardwoods will do for the rungs. Turned rungs look much the neatest, but the pieces from which they are turned should be split from the block—not sawed—as by splitting them we are sure of having the grain run full length of the rung.

Ladder Rungs

The rungs of factory-made ladders are often cylindrical in form with a shoulder at each end, but the rungs of the home-made ladder should be tapering and without the shoulder. Where it is not possible to have the rungs turned in a lathe they can be quite easily made by hand. Trim the pieces nearly to size with a hand axe and finish with a jack plane, tapering the rung from the center toward each end. An even finish is not necessary, but the ends of the rungs should be as nearly circular in section as possible. Make a hole in a block of wood with the bit it is intended to use for boring the ladder sides, and dress the ends of the rungs until they will just center this hole.

The rungs should not be less than $\frac{3}{4}$ in. at the ends— $\frac{1}{2}$ in. is better—and should always be used except in the case of a short ladder with narrow sides, when the larger hole might perhaps

weaken the sides too much. The centers of the rungs may be from $1\frac{1}{8}$ in. to $1\frac{1}{2}$ in. in diameter, depending upon their length and the material of which they are made.

When hardwood for the rungs is not obtainable they may be made of hard pine, in which case they should be of $\frac{1}{8} \times 1\frac{1}{2}$ in. stuff with the edges rounded. Two $\frac{13}{16}$ in. holes bored close

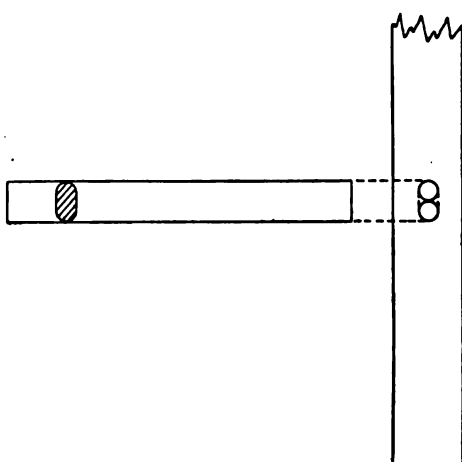


Fig. 207.—Showing Shape of Soft Wood Rung and Mortise for It.

together in the ladder side will make a mortise for the end of the rung as shown in Fig. 207. Of course, the small pieces between the holes must be removed with a chisel and it will be necessary to taper the ends of the rungs a little in order to have them enter the $\frac{13}{16}$ in. holes.

Ladder Sides

The sides of ladders are usually made tapering, being wider at the bottom than at the top, and the ladder is generally put together with a spread at the bottom, thus making each rung of a different length. Ladders made in this way have a good appearance and are in some cases a little easier to handle than those with straight sides, but they have no other advantage. The writer makes all of his ladders that are 12 ft. long or over with

parallel side pieces and of the same width throughout. This saves turning the ladders around in order to get them right end up when raising them; allows the rungs to wear equally on both sides, and makes it easier to tie two short ladders together to make a long one if this procedure is ever necessary.

Another point is that we sometimes lay a 1 x 12 in. board on the rungs of these ladders and use the combination as staging. The parallel ladder is of equal strength throughout and is, of course, more satisfactory for this purpose than those ladders having tapering sides.

The tapering ladders are made in the following proportions. The sides are $1\frac{3}{4}$ in. thick by $2\frac{1}{4}$ in. wide at the top, the width increasing $\frac{1}{4}$ in. for every 6 ft. of length, while the thickness remains the same throughout.

The top rung is $14\frac{1}{2}$ in. long over all and each succeeding rung is $\frac{1}{4}$ in. longer than the one preceding it. The rungs in all the ladders are spaced 12 in. on centers.

The sides of the longer ladders are made from $1\frac{1}{4}$ x 3 in. up to $1\frac{3}{4}$ x $3\frac{1}{2}$ in., depending somewhat upon the purpose for which they are to be used. We have a 28-ft. Oregon pine ladder with sides $1\frac{1}{4}$ x 3 in. One man can raise it alone, which makes it handy for some cases, but, though plenty strong enough, it is too limber or shaky for such work as carrying up bricks in a hod or even for carrying up shingles, although we often use it for this latter purpose.

Test for Ladders

We test all our ladders by supporting them at each end in a horizontal position and then loading the center of them with two kegs of nails. Of course, a ladder that will support this weight when in a horizontal position will support a great deal more when in an almost perpendicular position.

Marking Tapering Sides

Having cut and dressed the sides of the ladder to the size decided upon we next proceed to mark and bore the holes for the rungs. The holes must, of course, come in the center of the

width of the rails and for the tapering rails the easiest way to mark them is to set a marking gauge to half the width of the rail at its center and gauge from both edges. This will make two marks at every point but the center one, and the nose of the bit is entered midway between the two marks. This method is

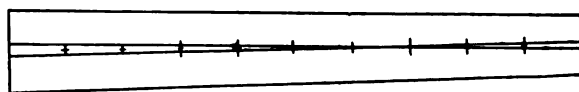


Fig. 208.—Method of Marking Center of Tapering Ladder Sides.

shown in exaggerated form in Fig. 208. Even the ladders with parallel sides are best gauged from both edges. The second marking does not take much time and obviates any mistake that may be made in setting the gauge. Only one side of the ladder needs marking because both pieces are clamped together and bored at one operation.

Boring Holes for Rungs

Boring the holes for the rungs is one of the most important portions of the work, because if the holes are not bored true there is no way of bracing the ladder square and keeping it so. Most men can keep a bit plumb one way while boring, but to be able to keep it plumb both ways requires a lot of practice.

One way of overcoming the difficulty will now be described. Cramp, or otherwise fasten, the two sides together and lay them marked side up on the saw horses. It is well, perhaps, right here to state that they must be so arranged that they do not sag between supports. Stand astride them and bore the first hole, keeping the bit as plumb as possible. Skip the second hole and bore the third one and continue in this manner, boring every alternate hole until the end of the ladder is reached. Then turn around and bore the balance of the holes while facing in the opposite direction.

It is easy to keep the bit plumb sideways by sighting down the length of the ladder's sides, standing erect as you bore, and in nine cases out of ten where a man cannot bore his holes quite

plumb they will all slant about the same amount in the same direction—either toward or away from the workman. Boring every alternate hole from the opposite direction will even things up so that the ladder will drive together square. It is hardly necessary to caution the mechanic that he must not force his bit all the way through when boring these holes, as doing so will, of course, mar and splinter the surface of the stick on the under side. The hole should be bored till the nose of the bit comes through and the bit ceases cutting, then after all the holes are bored the sticks are turned over and the holes finished from the other side.

Kink in Finishing Holes

There is a little “kink” in connection with this portion of the work and it is for this reason that I mention it. When finishing these holes turn the bit *backward*; the lips of the bit will cut out the remainder of the wood in the form of a small disk, leaving a perfectly clean hole; whereas, if you turn the bit forward it will often break through before the lips have completely cut around and thus leave the hole ragged.

Putting Ladder Together

In putting the ladder together lay one of the sides, inside face up, on something solid and enter all of the rungs part way. Lay the other side on the upper ends of the rungs and, commencing at one end, enter one rung at a time and drive the ladder together enough to keep the rungs in place. After all the rungs are entered drive the ladder together with a block of wood and a heavy hammer, mallet or hand axe, working from either side as occasion demands. Painting the ends of the rungs before entering them is a pretty good idea.

Fastening Rungs

In some places it is still thought necessary to wedge the ends of the rungs, but to my way of thinking two 6d or 8d finishing nails driven through the sides into the rung is a much easier method of fastening and will hold better than the wedges.

Where, on account of orders or for some other reason, wedging is employed, the ends of the rungs should be split with a saw—not with a chisel or hand axe—and the rungs must be so inserted that the wedges run crossways of the ladder sides as shown in Fig. 209.

If the wedges are placed lengthwise, driving them home will in all probability split the ladder side in two, especially if the rungs fit as they ought. After the rungs are fastened and trimmed off

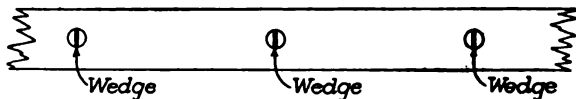


Fig. 209.— Showing How Wedges are Driven Crossways of Ladder Sides.

the ladder should receive a couple of coats of paint or varnish to preserve it from the effects of the sun and weather.

Long and heavy ladders often have iron rods run through them at intervals of about 10 ft. for the purpose of holding them together, but there have been many ladders which have lasted well and done good service without the aid of these rods.

Extension Ladder

An extension ladder is a very handy appliance—much more so than a person who has never used one would probably believe. Take as an example an extension ladder composed of two 16-ft. lengths or sections. With this one may make fifteen different lengths of ladder, ranging all the way from 16 to 30 ft. On outside work where the extra length of a ladder may be left projecting upward the advantage of these odd lengths is not appreciated, but when working inside or outside under an overhanging cornice it is readily noticeable.

The writer will now endeavor to describe the construction of an extension ladder which he devised for his own use and found quite serviceable. It consists of two parallel ladders each 16 ft. long, the sides of both ladders being $1\frac{1}{2}$ x 3 in. The top ladder is 16 in. wide outside measurement, while the lower ladder is $16\frac{1}{2}$ in. inside measurement, so that the top ladder will lie between the sides of it and slide easily. The size of the ladder is of minor

importance, as each one will, of course, make such a ladder as appears to him will best suit his needs. The chief item to be con-

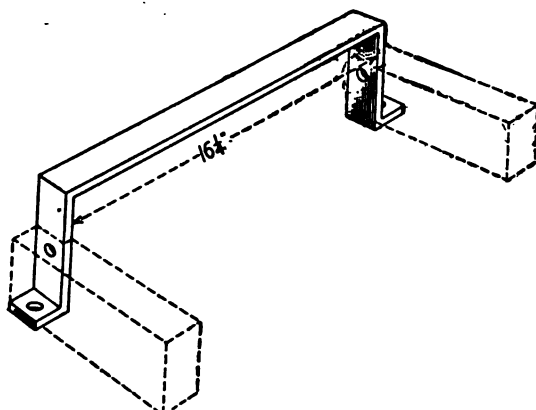
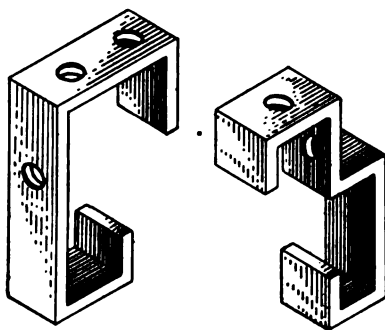


Fig. 210.—Iron Work for Upper End of Lower Ladder.

sidered is the method of holding the two sections together when the ladder is in use.

Fittings Required

The various fittings required are shown in Figs. 210 to 214, inclusive. The iron work for the upper end of the lower ladder shown in Fig. 210 is formed of $\frac{1}{2} \times 1\frac{1}{2}$ in. bar iron and presents no difficulty in the making, though care should be taken to keep the various measurements correct and the angles square. The dotted lines indicate the ends of the ladder sides and illustrate the manner in which the iron is fitted to them. Note that the iron is gained into the sides so as to leave no sharp edges for the upper ladder to rub against.



Figs. 211 and 212.—Two Forms of Irons for Foot of Upper Ladder.

Two different forms of irons for the foot of the upper ladder

are illustrated in Figs. 211 and 212. Fig. 211 is a little easier to make, but requires a block of wood to be fixed between it and

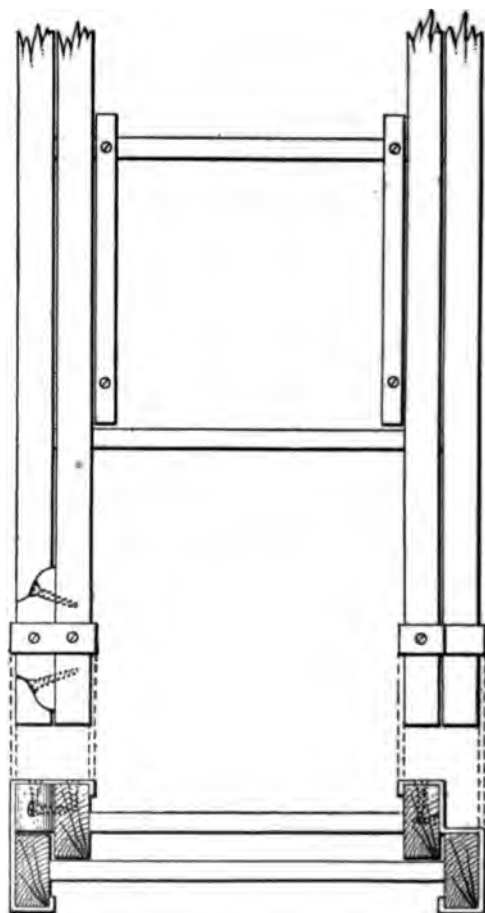


Fig. 213.—Plan and Cross Section of Ends of Ladder with the Two Different Irons in Place.

the ladder. This is shown more clearly in Fig. 213, which represents a plan and cross-section of the ends of the ladder with the two different irons in place.

Description of Catch

The catch or lock that holds the ladder extended is shown in Fig. 214. Two pieces of hardwood of the shape and dimensions indicated are fixed to a piece of $\frac{3}{4}$ in. pipe in the following manner: Holes the exact size of the outside diameter of the pipe are bored in the pieces of wood, which are then placed in position on the pipe, and holes for $\frac{1}{4}$ in. stove bolts are drilled right through both wood and pipe. A countersinking for the

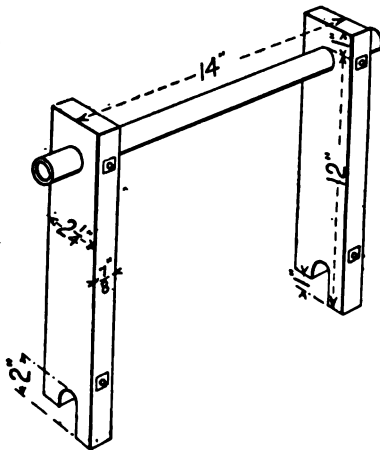


Fig. 214.—Catch or Lock which Holds the Ladder Extended.

nut of the stove bolt is cut in the wood and the bolts are inserted and tightened with a screwdriver. Bolts are placed in the same manner at the other end of the wooden strip to prevent them splitting, or rivets may be used in place of the bolts if so desired.

The catch is shown in its proper position in Fig. 213, where it will be seen that the piece of pipe takes the place of the second rung from the foot of the upper ladder; the holes that receive the pipe must be bored true and should be a trifle larger than the pipe, so as to permit the catch to swing easily.

Besides these fittings there is needed a small galvanized iron awning pulley and about 30 ft. of sash cord. The pulley is fastened to the center of the iron at the top of the lower ladder

with a link from a piece of $\frac{1}{4}$ in. chain. The link is cut through with a hack saw and opened to permit of the pulley being placed in it, and then it is passed through the hole drilled in the iron for its reception and closed.

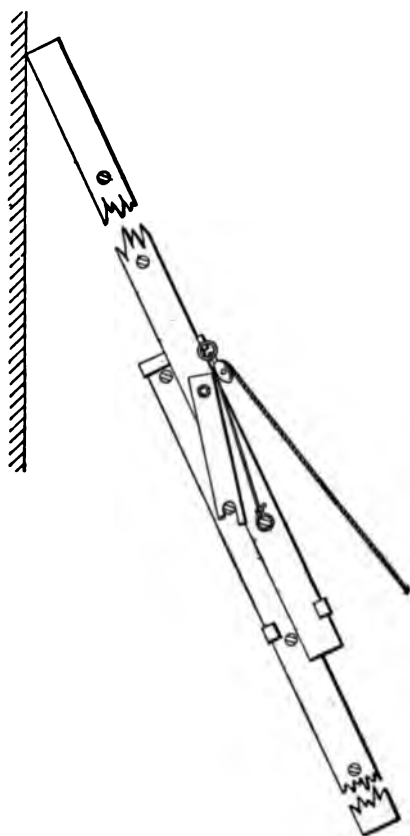


Fig. 215.—Ladder Shown Extended with "Catch" in Place.

After the ladders are put together one end of the sash cord is threaded through the pulley, brought down and made fast to the lowest rung of the top ladder; pulling on the other end of the cord raises the ladder and the catch holds it in place.

Fig. 215 represents a longitudinal section of the ladder showing it fully extended and with the catch in operation. The manner of working is very simple. As the cord raises the upper portion of the ladder, the catch is drawn over each rung in turn. Then at the proper height it is allowed to catch in the nearest rung, where it will hold the two ladders as firmly as if they were one piece. To lower the ladder pull on the cord until the catch clears the rung and drops behind it, then lower away. As the ladder descends the catch turns and points upward, and in practice we found it necessary to put two hardwood pins or dowels, one on each side of the ladder just above the catch, to prevent it from turning completely over and catching again—something it was very liable to do when the ladder was being lowered rapidly. One pin would perhaps have answered the purpose, but two were used to prevent any undue strain on the catch. In order to have the catch work properly the ladder must lean a little from the perpendicular, but as that is the way in which a ladder is most generally used, no excuses need to be offered upon that score.

The original ladder was made from material that was on hand, or easy to procure, and without doubt could be improved upon by any one caring to give the matter thought. Still it has answered our purpose, and though perhaps not quite so handy to manipulate as some of the best of the patented ladders, neither does it get out of order quite so easily.

A Rope Ladder

Ladders of almost every conceivable shape, size and design are at different times seen amongst the contractor's equipment, but the only rope ladder the writer ever saw in use was one that he made himself. This was at a time after he had left the jobbing shop, but he can easily remember a number of instances where the rope ladder would have done good service if he had thought of it at the time.

A rope ladder is by no means a handy thing from which to work, and is useful only in special cases: as, for instance, where on account of existing conditions a wooden ladder could not be used and where if you had not the rope ladder you would perhaps have to do the work while clinging to a single rope.

Rungs for Rope Ladder

The ladder about to be described is made with rope sides and wooden rungs. Two views of one of the rungs are shown in Fig. 216. The notches shown at the ends of the rungs are for the strands of the rope to lie in, the strands being separated at the proper point and the rung pushed in between them.

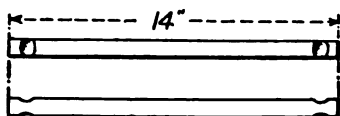


Fig. 216.—Two Views of One of the Rungs.

Kind of Rope Most Suitable

A rope with three strands is not suitable for this work, and as a four-strand rope was not available the writer overcame the difficulty by taking a sufficient length of $\frac{3}{8}$ -in. rope and twisting it up so as to form a rope of two strands. By twisting one side of the ladder right handed and the other left, and being careful to have the same number of twists on each side of the ladder between each pair of rungs, a ladder was made that would hang straight and not twist up on itself.

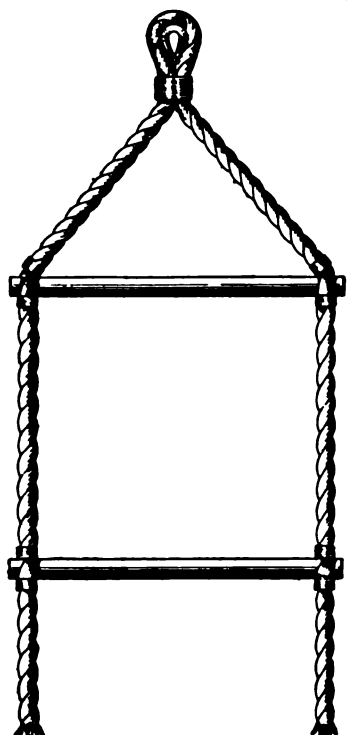


Fig. 217.—A Rope Ladder with Wooden Rungs.

The construction is shown quite clearly in Fig. 217. A galvanized iron thimble of the proper size was procured and two pieces of $\frac{3}{8}$ -in. rope placed in it and secured with a lashing, leaving four ends. Two of these ends were twisted together in one direction and the other two in the opposite direction as already described. The rungs were then inserted, properly

spaced and made secure with lashings as shown. Both ends of the ladder were finished alike, though if thought advisable one end could be finished with two loops or eyes. When suspended from the end with two loops the ladder has not quite as much chance to twist around, but as already intimated a rope ladder is a rather wriggly contrivance no matter how suspended.

Method of Lashing

An enlarged view of one of the lashings is shown in Fig. 218. After the twine is formed into a loop and laid along the rope with a sufficient number of turns taken around it, the free end of the twine is then passed through the loop and the latter is

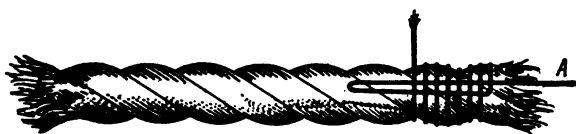


Fig. 218.—An Enlarged View of One of the Lashings.

drawn in under the lashing by pulling on the end "A." The turns of the twine are shown loose in Fig. 218 to more clearly illustrate the method. In practice they should lie quite close together and every turn drawn as tightly as possible. The twine should be of good quality and will hold better if rubbed with cobbler's wax.

Much might be written upon the different ways in which ladders may be used for scaffold work and other purposes, but as most of these methods are well known the writer will omit them and confine his closing remarks upon the subject of ladders to two instances of his own experience.

Using Ladder as Gin Pole

At one time having a number of steel smokestacks to erect in different parts of the country, it was desired to cut down the necessary equipment as much as possible, so as to have less of it to move from place to place. The smokestacks were from 25 to 35 ft. long, and we made a stoutly-built 28-ft. ladder answer the purpose of a gin pole. The ladder was much easier to erect than

the ordinary gin pole, especially in cases where it was necessary to place it on the top of a building, and was also much easier to ascend or descend when hitching or unhitching the tackle.

Climbing Flag Pole by Means of Ladders

At another time we received a rush order to put a new line on the flag pole on the tower of an office building. It had to be done at once because the old line had rotted and fallen to the foot of the pole and the next day was the Fourth of July or the King's Coronation or some such event. The top of the tower was flat and nearly 20 ft. square, and the pole, which extended 50 ft. above it, was weather-worn until it was as smooth as glass. This was not the first flag line we had replaced, but none of the previous methods used, such as shinning up the pole or using linemen's climbers seemed to apply in this case, so we did the job with three light ladders and a few feet of sash cord, placing the first ladder perpendicular close against the pole, lashing it fast and then placing the others above it and fastening them to the pole in the same way. The placing of the upper ladders was not so difficult as might at first be supposed. A piece of cord was tied in a loop around the pole to the upper rung of the ladder, another and longer cord was taken over the top rung of the ladder already in place and brought down and made fast to the foot of the ladder that was to be raised. One man followed the ladder up, guiding and helping to lift it, and the other hauled on the cord until the ladder was in position. The loop of cord around the pole kept the ladder perpendicular and held it well enough for a man to climb it and make it secure.

The ladders were part of the fire protection equipment of the building, so that the only material brought from the shop was the cord and a light rope for pulling the ladders up the outside of the tower from the main roof of the building. Incidentally it may be mentioned that we also secured the job of painting the pole by reason of our ladder arrangement, although we had to take the ladders down and erect them again for this purpose, not being able to paint the pole the day we put up the line for fear of spoiling the flag with fresh paint.

CHAPTER XVIII

FENCES, DESIGN AND CONSTRUCTION

PERHAPS there is not much of the science of carpentry in fence building, almost any one can build a fence—in fact, almost any one does—still the word “fence” includes such a variety of designs and structures that we may, perhaps, be able to point out one or two items that will possess interest. In what follows it is not the intention to discuss the subject of design so much as methods of working, and to those who have not given this matter consideration the writer would suggest that there is more to it than might at first be supposed. The fence across the front of our neighbor’s 50-ft. lot may be a thing of beauty and intricate workmanship, but the fence around the baseball park although built of rough lumber required just as much thought in the planning and building, while offering more chance for costly mistakes.

Locating Corners

In commencing to build our fence one of the first things needed is the exact location. Sometimes if this is very important the corners of the fence will be staked out by an engineer, who generally sets a wooden stake of about 2 in. square section, in the top of which he drives a tack or brad to indicate the exact corner. Many workmen carelessly remove these stakes when setting the corner posts, but wherever possible they should be left in place so as to avoid any chance of mistakes and to settle any dispute that may afterward arise.

Where the fence rails to which the pickets or fence boards are fastened project an inch or more from the face of the posts it is easy to leave the corner stake in place, as shown in Fig. 219 of the sketches, but if the post itself comes out to the exact corner of the fence it is, of course, necessary to remove the stake. In a case of this kind before moving the stake drive in two others,

as shown in Fig. 220, and set a brad in the top of each, exactly 12 in. distant from the brad in the original corner stake. This stake can now be removed and the exact corner found at any time by simply measuring 12 in. out from each of the brads in the two stakes in question. If the two stakes are to be permanent they should be driven until firm and then cut off flush

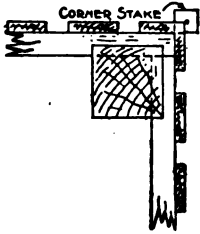


Fig. 219.—When Corner Stake May be Left in Position.

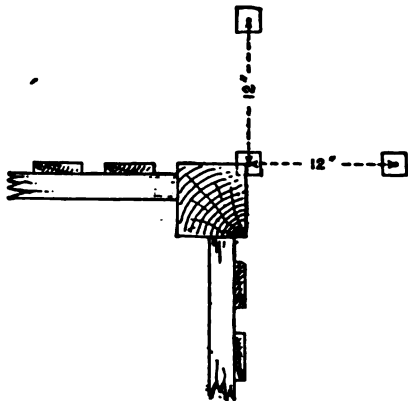


Fig. 220.—When It Is Necessary to Remove the Corner Stake.

with the surface of the ground, or perhaps a little below it. If the original stake projects some distance above the ground, making it difficult from which to measure, suspend immediately above it a plumb line from some temporary structure—with proper care a saw horse will answer. Now cut off the stake or remove it entirely; lower the plumb line sufficiently and measure from it.

The reader will understand he is advised to set these stakes for his own protection. The work does not take long and when one positively knows he is right and can prove it, he does not have to bluff anybody and by the same token he does not have to let anybody bluff him. The idea can, of course, be used for locating points other than fence corners, and when more permanent marks are desired iron pins are used in lieu of the wooden stakes with center-punch marks instead of the brads. Of course, any other measurement can be used in place of the 12 in., but it

is about the easiest to remember, and perhaps on that account offers the smallest chance for mistakes.

Spacing Posts

Having located the corner posts, set the laborer or laborers to work digging for them while you space out the others. If the posts are to be equidistant, set out the length of one or more spaces on a rod. Stretch a line from one corner stake to another and go over the entire distance with your rod, driving a small peg for the center of the face of each post 8 or 10 in. out from the line. These pegs are left in position and when carefully placed can be used for the proper spacing of the posts when we come to the setting of them. In soft ground any small sticks of wood will serve for the pegs. Where the ground is hard, use nails or spikes.

Proper Digging Tools

The proper tools for digging the post holes are a long-handle, round-pointed shovel and a digging bar such as are illustrated in Figs. 221 and 222. The shovel is a stock pattern and the bar can be made at the nearest blacksmith's. The knob on the end of the bar is used as a tamper when setting the posts.

Where only one or two holes are to be dug the equipment is not of much importance, but for a large number we shall save money by using the proper tools. Post hole diggers can be used in some cases, but the tools illustrated are the best for all-round work.

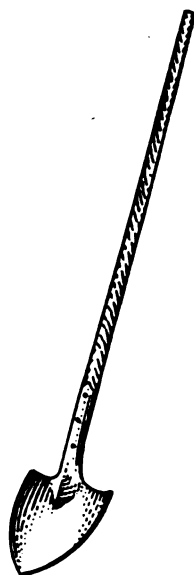


Fig. 221.—A Long Handle Shovel for Digging Post Holes.

Plumbing the Posts

In setting the posts set the corner ones first, being careful to get them plumb both ways; then stretch two lines across the face

of them from one corner post to the other—one line at the top of the posts, the other near the ground. The two lines will keep the face of the intermediate posts plumb, you can hold a level on them to keep them plumb sideways and the small pegs or nails previously driven in the ground will give you the correct spacing. Your assistant fills in a few inches of dirt around the foot of the post, tamping it firm while you hold it in place, after which you may do the tamping as he fills up the hole, or if there are more men to be kept busy you two can go ahead setting the

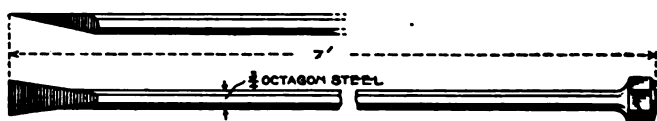


Fig. 222.—Flat and Side Views of a Digging Bar.

posts in this manner and leaving the balance of the hole to be filled by others. Once the foot of the post is firmly fixed in place we need not be quite so careful about keeping the post plumb, because it can be brought back to position after the hole is filled.

In advising the plumbing of the posts with a level we are assuming that square posts are to be used. Many fences, however, are built with round, tapering posts, the posts being nothing but small trees cut to the proper length, oftentimes with the bark still on them, and the novice is sometimes puzzled for a method of getting them plumb. Step back a few feet from the post, hold a plumb bob and line in your hand and sight past the line to the post. This is for plumbing the posts sideways; on the face side they can be made plumb by bringing them up to the two lines stretched from the corner posts as already described. The corner posts must, of course, be plumbed both ways with the plumb bob and line. Posts that are split from the log and have neither straight nor square sides may be made approximately plumb by the same method.

Lining Up Top of Fence

In some cases the posts are set in the ground and their tops are cut to line afterward; in others the posts are cut to length and

their tops must be brought to line as they are set. Long fences seldom run level for their entire length and frequently the tops of them run up and down following the contour of the ground.

Where the posts are cut to a length first and their tops are to be brought to a straight line—either level or with a grade—they can be set by sighting across the tops of the corner posts. On the other hand, you may set every third or fourth post by sighting and using a line for setting the intermediate ones. The trouble with a line is that there is always some sag to it if of any length, and the writer obtains better results by trusting entirely to his eyesight. In this connection it will be well to observe that where the fence is very long it will also be necessary to sight the intermediate posts to which to stretch the face lines, because it takes very little wind to blow a horizontal curve in 50 or 60 ft. of line, no matter how tight it may be stretched.

In a case where the posts are cut to length and the fence must follow the contour of the ground, it is better to fit several sections together and bring the tops of the posts to the proper curve all at once than to try and line them up one post or panel at a time.

Where the posts are to be cut off after they are in the ground and the tops of them will run in a straight line, mark the correct height on the two corner posts and tack a piece of board with its upper edge at the mark on the further post. This piece of board is for sighting, and if the posts are far apart it may be necessary to paint it white or fasten on it a piece of white paper so as to make it show clearly and distinctly.

Now take a straight-edged board and with an assistant holding the far end of it place your end against the mark on the post and sight along the upper edge of the board while the assistant raises or lowers his end until the sight line along the board just hits the upper edge of the mark on the farther post. Mark the posts along the edge of the board; move forward the length of it, then sight and mark again until you have gone the full length of the fence.

The writer here wishes to offer a few remarks. He has used this method of striking lines both on vertical and horizontal

surfaces for many years with considerable success, but has often found it difficult to get other workmen to follow his instructions in this matter. • Even where the workman has been compelled by orders to follow this method and has thus been shown that a perfect line may be obtained in this way he seems to think it was only by a lucky fluke he got it right, and if left to his own devices will the next time use his little ball of string. As an illustration of how little chance for error there is in this method we will take an example. Suppose the straight edge is 16 ft. long and the fence is 160 ft. This makes the fence ten times as long as the straight edge, therefore any error in the position of the straight edge will be multiplied ten times in the length of the fence. In other words, if the end of the straight edge held by your assistant is $\frac{1}{4}$ in. too high the line of sight instead of hitting the top edge of the mark on the post that is 160 ft. away from you will hit $1\frac{1}{4}$ in. above it. Or to explain it differently,

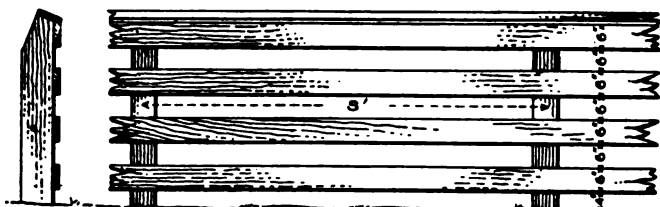


Fig. 223.—Section and Elevation of a Fence Composed of Horizontal Members.

you can sight your straight edge a full inch off the mark at this distance and then will be only $\frac{1}{10}$ inch out of line in 16 ft.

Apart from all this you must not overlook the fact that any mistake is corrected every time the straight edge is moved, because you sight from the mark you have just made to the mark on the post, and the nearer you get to the post the easier it is to sight to it.

Where the posts are to be cut off so as to follow the contour of the ground, the lengths of the posts may be marked directly from the ground, if the latter be level or even, but as a general thing it will be better to tack full-length boards along the posts at the ground line and then measure from the boards. This is

especially useful where the fence is composed of horizontal members, as shown in Fig. 223, which are difficult to apply if the curves of the fence are too sharp.

Cutting Posts to Bevel

The tops of the posts are usually cut with a slope so as to shed the water. Where there are only a few of them they may be cut with a hand saw, but for a large number two men with a cross-cut saw will make much better time. When cutting posts by this method it is better to have guides for the saw to run on, as they

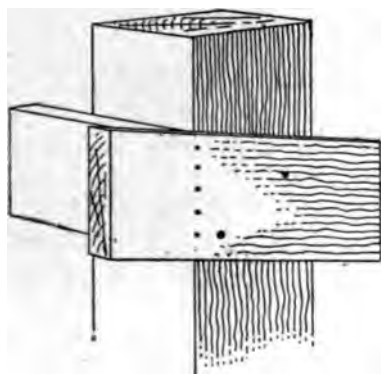


Fig. 224.—One Style of Saw Guide for Use in Cutting Off the Tops of Posts.

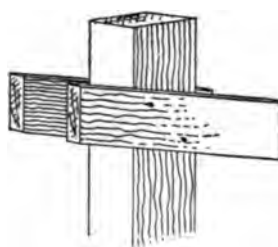


Fig. 225.—Another Style of Saw Guide.

make the sawing much easier. One style of guide is shown in Fig. 224. This is easy to apply to the post, but requires skilled workmen on the saw; another method is shown in Fig. 225, and here the post is first marked on both sides with the proper bevel, strips of wood are tacked on the post at these marks and the saw runs on the strips of wood.

Setting Gate Posts

If the gates in the fence are wide and heavy the posts to which they are hung require special attention. They should be set deeper than the other posts and should, if possible, be braced in some manner that will keep them plumb. Where the fence is

6 ft. or more in height one of the easiest ways of bracing the gate posts is to extend them upward to a height that will clear a carriage or whatever is expected to pass under them—a height

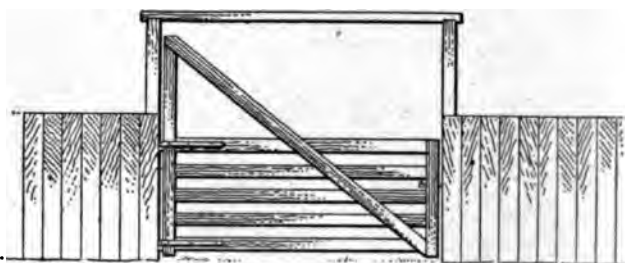


Fig. 226.—A Good Method of Bracing Gate Posts When the Fence is 6 Ft. or More in Height.

of 10 ft. is usually sufficient—and then to place a cap across their upper ends, as clearly illustrated in Fig. 226 of the sketches. There are many instances where this arrangement would be objectionable.

Bracing Large Posts, Flag Poles, etc.

Where the materials are at hand or easy to procure the gate posts may be set in concrete, and if enough of it is used it makes a lasting and solid job; but taking everything into consideration the method illustrated in Fig. 227 is, in the writer's opinion, the best of them all. This sketch shows the post as it appears before it is set in the hole. The braces shown are intended to be kept just below the ground line and the cross planks at the foot of the post should be of such length as will let the braces run at about an angle of 45 deg.

The scheme can be used for other things besides gate posts, such as posts for clothes lines, for clothes dryers or for the foot of flag poles, and it may be observed in passing that the method of plumbing round and tapering fence posts described in the foregoing is the best method that can be used for plumbing flag poles or similar articles. Hang up two plumb lines at a sufficient distance so that by sighting past them you may take in the full

length of the pole, and then plumb the pole both ways by sighting past each plumb line in turn.

Plumbing Flag Poles

Flag poles are usually made of entire trees and, though appearing straight and true to the eye, are very seldom sufficiently

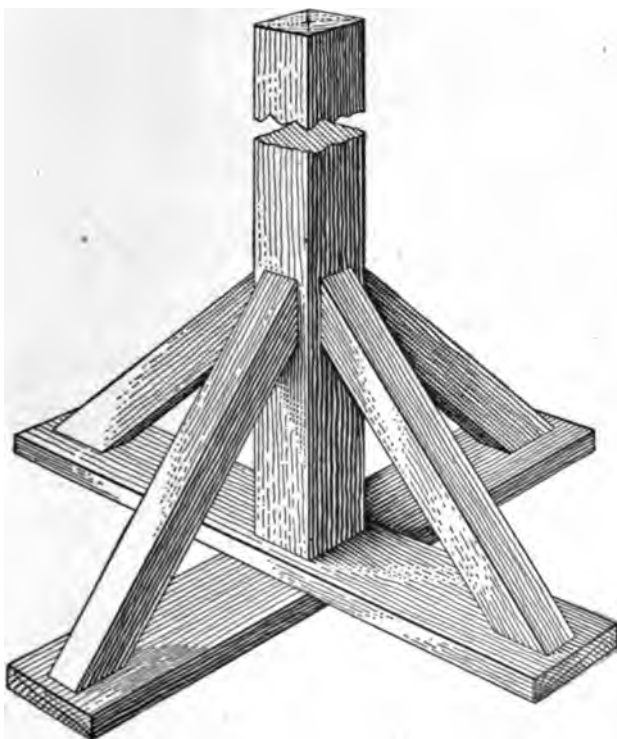


Fig. 227.—Perspective View of a Gate Post Before it is Set in the Ground.

so to permit of plumbing them by any other means. A very general practice is to plumb them by sighting them with the corner of some building at a little distance, but the two plumb lines offer a better method, especially when the pole is being erected on the top of a building.

Where the braces and cross-pieces shown in Fig. 227 are small, as in the case of a gate post, a square hole may be dug in the

many variations of this fence which depend chiefly on the spacing of the pickets and rails. The spacing runs from 6 to 12 in.



Fig. 232.—Fence Built of Rough Lumber.



Fig. 233.—Fence Similar to Fig. 232, but Having Posts on Outside.

and the sizes of the material from 1 x 2 in. to 1 x 4 in., while the posts are 4 x 4 in. to 4 x 6 in.

The fences are most frequently built of rough lumber and

are stained to harmonize with the house. They depend considerably for their artistic effects upon the vines and flowers that are trained over them, and Fig. 232 is a very good illustration of what may be done in this way.

Fence with Posts on Outside

In the photographic reproduction presented in Fig. 233 is an illustration of a similar but more substantial fence. It is chiefly noticeable for being built in the opposite way to most fences; that is, with the posts on the outside.

Elaborate Back Fence

The fence shown in Fig. 234 is rather an elaborate affair for a back fence. It certainly cost a lot more money to build than



Fig. 234.—An Elaborate Back Fence.

did either of those shown in Fig. 232 or Fig. 233, and as in all probability the carpenter got his share out of it "let's say no more about it."

Shingled Fence

The picture in Fig. 235 shows a shingled fence on the side of a corner lot. It looks very appropriate as a continuation of the shingled exterior of the house and offers a good idea to the fence builder.

Stone Fence

The fence shown in the picture, Fig. 236, is altogether outside the carpenter's line, but an excellent illustration of what can



Fig. 235.—A Shingled Fence.



Fig. 236.—Fence Constructed of Cobblestones with Iron Chains Suspended from Pier to Pier.

be made into an appropriate fence. There is a 2-in. iron pipe imbedded in the center of each of the small piers, the pipe terminating in a cast iron ball, and a heavy chain is attached to

the ball and hung from one pier to the other. These details do not show very clearly in the photograph and probably will not show at all in the reproduction, which is just the reason why it has been mentioned here.

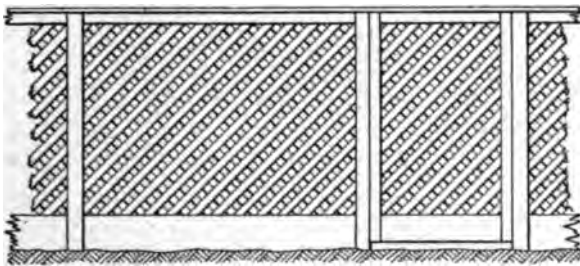


Fig. 237.—A Lattice Fence.

Lattice Fence

The lattice fence presented in Fig. 237 is another popular side fence for a bungalow. It has some variations. Sometimes the

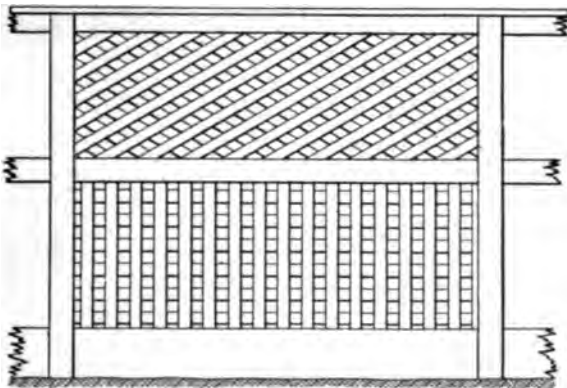


Fig. 238.—Showing Lattice Work Running Diagonally, Vertically and Horizontally.

lattice work is put together diagonally, as indicated, sometimes it is put together with the strips running vertically and horizontally, and sometimes a mixture of both is used, as shown in Fig. 238.

Close Board Fence with Lattice Openings

A rather unique type of fence is that illustrated in Fig. 239. It is a high board fence built of matched and beaded lumber with openings cut in every panel just above the height of an

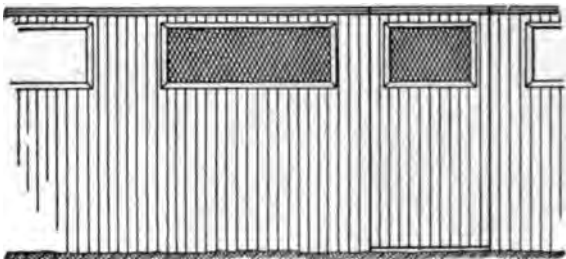


Fig. 239.—Unique Type of Fence Built of Matched and Beaded Lumber.

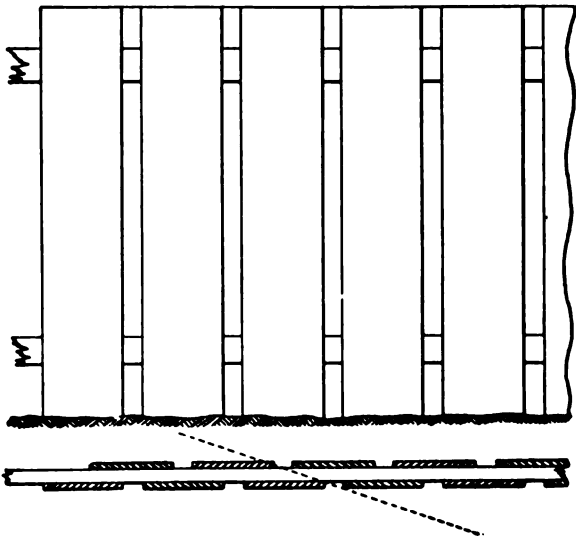


Fig. 240.—Elevation and Horizontal Section of a Close Boarded Fence.

inquisitive youngster's head and with the openings filled with lattice work. The holes are cut in the fence after it is built. The lattice is just the thickness of the boarding and is held in

place with a 1 x 3 in. casing that is mitered around the opening on either side of the fence.

An Oddity in Close Board Fences

We have in Fig. 240 something of an oddity that was designed for a person who wanted a close board fence, but one through which he could train vines. As shown in the sketch the fence

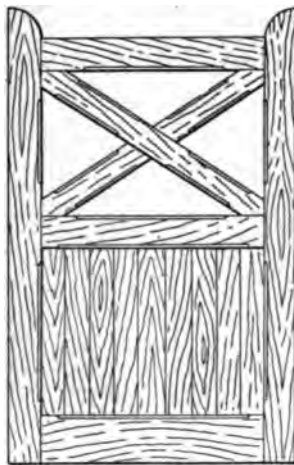


Fig. 241.—Design for an Entrance Gate.

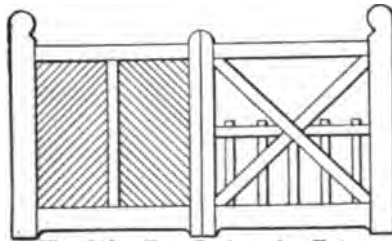


Fig. 242.—Two Designs for Entrance Gates.

is boarded on both sides, but there is a small space between each board, the size of the spacing depending upon the widths of the boards and upon how much privacy is desired. Arranged as shown it is impossible to see through the fence, as is proven by

the dotted line in the plan view. One of the cheif merits of this fence appears to be in the fact that it is different from that of anybody else.

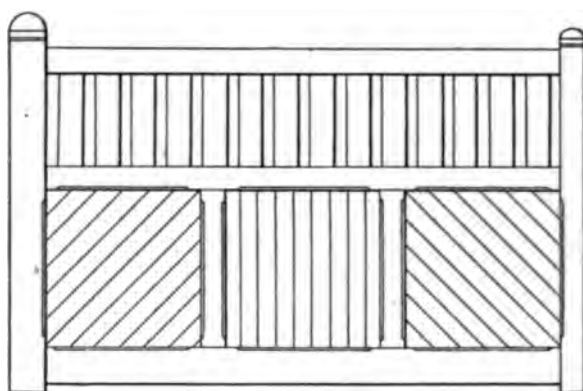


Fig. 243.—Another Style of Entrance Gate.—Scale, $\frac{3}{4}$ In. to the Foot.

Figs. 241, 242 and 243 represent designs for entrance gates. There is not much call for them at the present time, but perhaps at some future date the ideas contained in their construction may prove useful.

CHAPTER XIX

SHOP KINKS

A FEW years ago there appeared in the correspondence pages of our old friend, *Carpentry and Building*, a discussion as to the best method of erasing ink lines from paper. After different correspondents had expressed their views—one using a piece of broken glass, another a piece of fine sand-paper, and so on—a contributor to the columns came forward with the suggestion that they try a piece of rubber ink eraser. So in presenting the following collection of kinks or wrinkles (call them what you choose) the writer will state at the outset that in many cases they are only makeshifts to be used in the absence of the proper equipment. A number of them are, so far as he knows, original with himself, but as we may safely as-

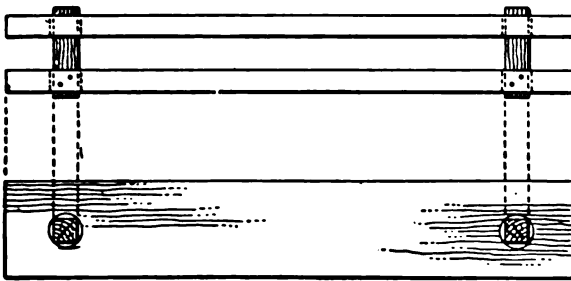


Fig. 244.—Plan and Elevation of Form of Clamp Sometimes Used.

sume that the reader is more interested in their utility than the source of their origin we will say no more on that head, but proceed to business.

Wooden Clamps

There never seems to be a sufficient number of clamps in the jobbing shop to meet all requirements, and nearly every large job calls for a number of wooden makeshifts. In Fig. 244 there

is presented a plan and elevation of one that is sometimes used. It consists of two pieces of board with holes bored through them at the proper distance and the holes fitted with wooden pins. The pins are made fast in the lower board with a couple of nails, but their upper ends are of such a size as to permit the top board to lift off without the least trouble.

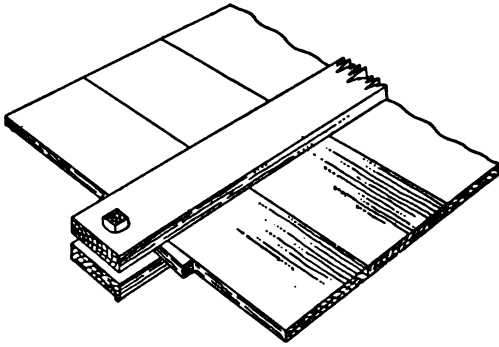


Fig. 245.—The Clamp in Use, Showing Wedge for Tightly Holding the Material Together.

In use, the material to be cramped is laid between the pins on the lower board, while the upper board is dropped down on to it and a hardwood wedge driven in between the material and one of the pins, as clearly indicated in Fig. 245. The pins may be round or square in section, according to choice.

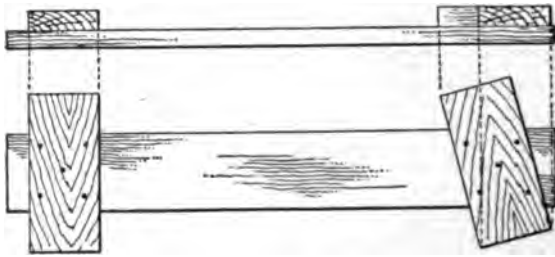


Fig. 246.—Style of Temporary Clamp. Frequently Used.

At first sight this appears to be a first-rate clamp, and one can certainly get a lot of power with it, but it is awkward to handle and cannot be used so easily as the clamp shown in Fig. 245.

This one is perhaps used more than any other style of temporary clamp. It is well known to most woodworkers, but when constructed as shown in the sketch—which it frequently is—it has a

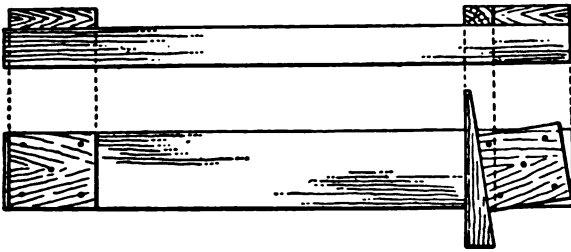


Fig. 247.—A Much Better Form of Construction than that Shown in Fig. 246.

number of serious faults. Fig. 247 illustrates a much better form of construction.

As made in Fig. 246 the body of the clamp is generally a piece of 1 x 4 in. stuff with two pieces of the same material nailed across it. The bevel of the piece at the wedge end is usually a matter of guess, and the wedge is chopped out with a hand axe—also by guess—with the result that it is frequently made much too wide.

Best Form of Clamp

In Fig. 247 the body of the clamp is of 2 x 4 in. stuff in cross section, which permits better nailing of the blocks at the ends and also obviates the tendency which a long clamp has to buckle when the wedge is driven up tight. The blocks at the ends are placed lengthways with a clamp instead of across it, and one will never believe how much

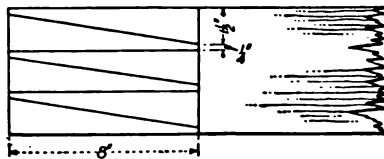


Fig. 248.—Size and Method of Cutting Wedges.

of an improvement that is until he has tried both methods. The bevel of the block at the wedge end is found by cutting the wedge first, laying it against a square line marked across the clamp

and then nailing the block close up to the wedge. Fig. 248 shows the size of the wedges and how they are cut from the end of a scrap piece of hardwood. This is perhaps a small matter, but when six or eight of these temporary clamps are in use a lot of time can be saved by having the wedges all alike, so that any wedge will fit any clamp.

Double Clamps

On such work as gluing up thin stuff for drawer bottoms the writer prefers this style of clamp to the steel variety. In the making of pantry fixtures for a number of dwelling houses the writer has had as many as twenty or thirty drawers to make, all of a size. In cases of that kind the clamps would be made double; that is, with cleats on both sides of the 2 x 4, and a drawer bottom would be clamped up on one side with a 1½-in. brad driven through the center of it into the clamp to prevent the bottom buckling out of place when the clamp was turned over. The brad is first driven through a small scrap of ½-in.

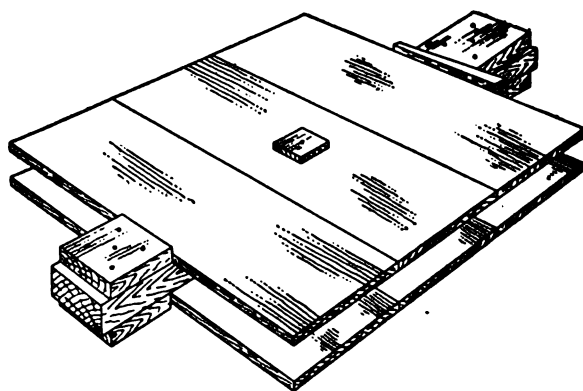


Fig. 249.—View of Double Clamp with the Two Bottoms in Position and the Blocks of Wood in Place.

board, which helps to better hold the bottom in place, but is used chiefly for the advantage which it offers of withdrawing the brad after it has served its purpose.

It may be observed in passing that the brad is often useful

on the single clamps. The thin material of which drawer bottoms are made is usually more or less warped and difficult to squeeze together, so that it is well to arrange the pieces forming the bottom in such a way that the pressure of the clamp will tend to buckle the center upward and then drive a brad down through the center, as already explained. The hole made by the brad is never noticed in the finished drawer bottom. If it should be it is easily plugged with a sliver of wood.

Fig. 249 shows the double clamp with the two bottoms in position and the blocks of wood with the brad in place.

A Nailing Kink

This scheme of using a block of wood under the nail head can be employed to advantage in lots of cases where the nail is driven only temporarily. The usual method is to leave the head of the nail projecting a short distance, so as to enable the clawbar or hammer to take hold of it. This does not always answer, for sometimes the nail is required to draw two pieces together, and to do this it must be driven up to the head. Where the block of wood is used the hammer or clawbar may be inserted under it, or it may be split out with a chisel, which leaves the nail free to be taken hold of in the usual way.

Sash Clamps

In Fig. 250 is presented another form of wooden clamp. This is by no means a temporary affair. We had a pair of these clamps for gluing up sash, and outside of the wonderful contrivances that are used for that purpose by up-to-date sash and door factories—in which a foot lever clamps all corners of the sash at once—it is the best thing for the purpose the writer ever saw. The clamps are fixed to the bench or saw horses and made out of winding and square with each other; the sash is laid on them and a couple of taps with a mallet on the wedges brings everything up tight. The width of any of these wooden clamps may be varied by inserting parallel strips of wood between the material and the square end of the clamp. This is better than using different sizes of wedges. The various

screw clamps, hand screws, etc., do not come under the heading of the present article, so the writer will pass them by.

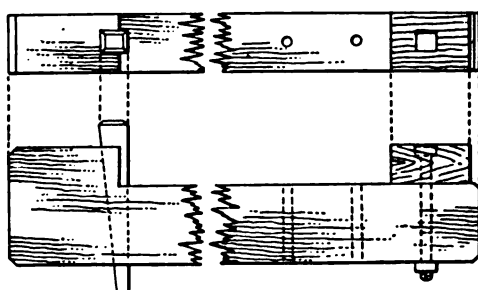


Fig. 250.—Another Form of Wooden Clamp which Serves an Excellent Purpose.

Clothes-Pin Clamp

Most of the readers are familiar with the spring clothes-pin illustrated in Fig. 251. A dozen of them can be bought for a dime; they do not take up much room, and can often be used to advantage on repair work and other jobbing-shop items.



Fig. 251.—A Spring Clothes Pin.

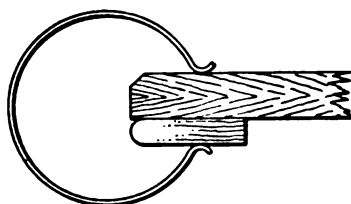


Fig. 253.—Clamp with Ends so Made as Not to Mar the Material.

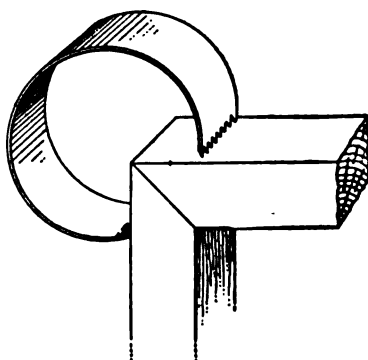


Fig. 252.—Small Clamp with Teeth Made from Piece of Door Spring.

Spring Clamp

In Fig. 252 is shown a small clamp made from a piece of spiral door check spring. It can be made with teeth, as shown in

Fig. 252, or with ends that will not mar the material, as in Fig. 253. Of course, it is not necessary to get a door check spring to make this article, as a piece of heavy steel wire bent to the proper form and with the ends pointed will serve almost as well. The original of Fig. 252 was made from a door check spring because the writer happened to have a broken spring on his bench when the need for the clamp arose.

Some Boring Kinks

The expansive bit is a first rate emergency tool, but it takes considerable power to turn the larger sizes through hardwood. This, however, is naturally to be expected. Before the invention of this bit almost any hole larger than $1\frac{1}{2}$ in. had to be bored with an auger, but nowadays many people expect to bore a 3-in. hole through a hardwood floor with one of these bits held in a brace of 6-in. sweep.

When boring in hardwood a good deal of the power required to turn one of these bits is used up in forcing the nose of the bit through the material, and the writer has found it a good scheme to first bore a small hole, say, about $\frac{1}{8}$ in., in diameter and have the nose of the bit to follow. It is sometimes difficult to bore a straight hole with one of these bits, but this scheme of running the small bit through first will help out every time. Of course, the small hole must be straight and should be of such a size that the thread on the nose of the expansive bit will take hold in it.

Sometimes it is necessary to bore a straight hole between two pieces of wood. To do this make a saw kerf across each piece about 1-16 in. deep; clamp the two pieces together so that the saw kerfs coincide and form a small hole through between them; insert the nose of the bit in this small hole and bore away. If the saw kerfs are straight and square with the stick the hole will be the same, for the bit will always follow the saw kerf.

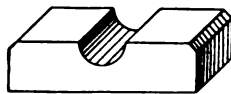


FIG. 254.—Support for Pipes or Shafting. Two of Which May Be Cut at One Time.

In Fig. 254 is shown a support for pipes or shafting. Two

of these can be cut at one time by the scheme just described.

Sometimes when inserting long wood screws a bit of just the right size is not at hand. A wire nail held in the brace and used like a bit is a good makeshift. Some carpenters use the nail for this purpose by driving it in with a hammer and then pulling it out again. Using it in the brace, however, is a better and more workmanlike method.

Removing Old Nails

A quill bit of the proper size will remove any of the old nails that are met with in repair work. This style of bit will cut around the nail and the nail will come out with the core. The first time the writer used this "kink" was in removing a broken screw from the lower end of a table leg. The screw had to be removed to make way for the shank of a caster. The bit used was just the right size, so that one operation took out the old screw and made the hole for the caster—the slickest thing you ever saw.

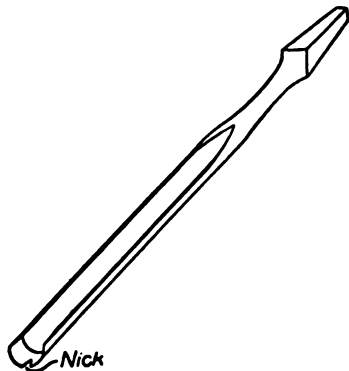


Fig. 255.—Bit with "Nick" for Removing Old Nails or Screws.

Improving a Quill Bit

A nick made with a three-cornered file in the ends of these bits improves their cutting qualities. Fig. 255 shows the nick in the end of the bit.

Cutting Circular Holes in Thick Plank

When cutting circular holes from 5 to 12 in. in diameter through plank 3 in. or more in thickness it is usually much easier to cut them with a bit than with a compass saw. Just strike out the size of the hole with the compasses and then bore around the outside of the circle with a $\frac{1}{2}$ -in. bit until the piece falls out. With a little trimming a hole cut in this manner

usually presents a better appearance than one cut with a saw, and any one who has ever tried to cut heavy planks with a compass saw knows just what kind of a job it is. Quite often timbers or beams in awkward places can be cut through with a brace and bit when it is impossible to cut them with axe or saw.

Extracting a Broken Auger

The writer, with an assistant, was at one time working on a repair to the boom of a steam shovel. The boom was composed of two sticks of oak 8 in. wide and 22 in. deep. Heavy plates of steel were to be fastened along the edges of these sticks by means of 1½-in. bolts which passed through the sticks the 22-in. way. We had nothing to do with the steel plates, as they were the machinist's work, but we had to bore holes for the bolts, and as the sticks were as green as the hills of old Ireland, believe me, the boring was something of a job. We were using an auger with a cross handle—known in the catalogues as a nut auger—and were working overtime by lantern light. We had everything finished excepting these holes, and the machinist crew was waiting for us to get through so they could get the ironwork in place and have the shovel ready for work the next morning.

What happened? We broke the auger off in the center of the stick. How's that for a fix? We had three or four more holes to bore and this was the only auger in our possession. A bolt *must* go through where the auger was now embedded in the wood, and in figuring out some method of removing it the fact must be remembered that it was in so tight that we twisted the stem of the auger off when trying to turn it. The stem of the auger had been lengthened at some previous date, and it broke at the scarf where it had been welded. The end of the stem left in the stick was some inches below the surface; if it had been projecting above we might have turned the auger out with a pipe wrench, or if we had had another auger we might have bored from the other side and driven the broken one out with a drift. The trouble was we needed what was left of it to finish the job.

made useful in more than a dozen different ways. Here is one of them and you can think out the others for yourself.

Blue prints or working drawings arrive in the shop or out on the job in a roll. The workman spreads them out flat, lays a chisel on one corner, his hammer on another, a block of wood on the third, and a piece of brick on the fourth corner. Every time he moves he knocks one of these improvised paper weights out of place, and the patience he displays in putting them back again is really wonderful. A few thumb tacks pushed into a cork and carried in the tool box will avoid all this bother.

The Bench Knife

The bench knife is a tool of every-day use in Europe, but is not so well known or used in America. It is nothing but a piece of the blade of an old dinner knife about $1\frac{1}{4}$ or $1\frac{1}{2}$ in. long, and is used in lieu of a nail for holding material on the bench. It is used at the opposite end to the bench stop, being driven partly into the bench and partly into the material, as shown in Fig. 257.

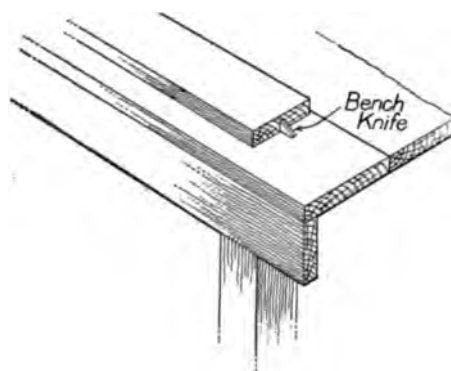


Fig. 257.—Application of Bench Knife.

For thinner stuff it is driven deeper into the bench. It is easy to apply, can be readily removed with a claw hammer, and does not mar the bench or material so badly as other forms of fastening. It is a good idea to have two or three of these bench knives because it is so easy to mislay them in the shavings.

Fastening a Screw in End Grain

Any one who has made the experiment knows that a wood screw does not hold so well parallel with the grain (shop parlance "in end wood") as it does across it. A good way to overcome the difficulty is to fit a plug of wood crossways of the grain in the piece into which the screw is to be driven. This is illustrated in Fig. 258, which shows a method of fastening one of the lower rungs to the leg of a chair. The screw is long enough to reach through the plug of wood and the combination acts somewhat in the manner of a bolt and nut. It is not necessary to bore all the way through the rung for the plug, although where appearance is of no moment it is easier to do so.

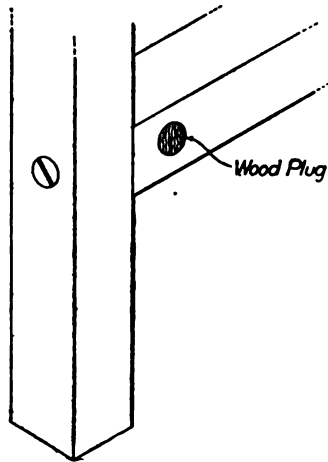


Fig. 258.—Method of Holding Wood Screw in End Grain.

Screweyes

Screweyes can sometimes be used in place of wood screws to advantage, especially for temporary fixtures, because they can be inserted or withdrawn without the aid of a screwdriver.

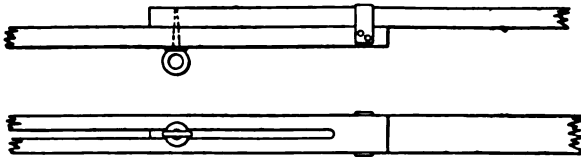


Fig. 259.—Screweye Used as Gauge Fastener.

Fig. 259 shows a form of gauge for inside measurements in which a screweye in conjunction with a small washer is used for holding the two pieces at the proper distance.

Marking Out a Glass Board

One day we were called upon to make a new glass board for the shop; that is, a board on which to cut glass. Marking one of these boards into inches and fractions is a slow and tedious job and one in which mistakes are very liable to happen. To avoid this difficulty we procured two yard sticks—such as are given away by hardware stores for advertising purposes—and then plowing grooves of the correct size at the top and bottom of the board we glued the yard sticks into them. We sunk the yard sticks a little below the surface to avoid wear on the figures and gave the whole thing a coat of shellac.

Our Shellac Bottle

A bottle of shellac and a brush is a handy combination to have around either in the shop or in the household. The brush must be left in the shellac and the shellac kept from the air if it is expected to remain in good condition. The writer's outfit is here described.

Select a pickle jar with a wide mouth, then get a good bristle brush that will easily enter the mouth of the jar. Cut a circle out of a piece of leather about 1 in. in diameter larger than the mouth of the jar; make a small hole in the center of this circle and force the handle of the brush through it. Fill the jar nearly full of shellac and drop the brush into it so that the leather circle or collar sits on the top of the jar. To make the joint air tight run a brush-full of shellac around the mouth of the jar. drop the brush in again and hold the leather down on the jar for a few seconds until the shellac sets. The shellac will stick the leather to the jar, but it can be easily removed when required for use and can be as easily fixed in place once more after you are through with it.

A Sandpaper Kink

Take a sheet of sandpaper or coarse emery cloth and glue it flat on a piece of $\frac{1}{2}$ -in pine board. After the glue has set, rip the board into strips with a saw. These strips with the sandpaper attached can be used the same as a file or rasp for smooth-

ing up the corners or crevices of woodwork. The sandpaper cuts faster than a file and if necessary the sticks can be whittled down at the end so as to permit them to enter places where a file cannot be used. It is best to wait until your saw needs filing before cutting up the board, because it certainly will need filing after using it for that purpose. The sandpaper does not hurt a dull saw to any extent, but it will surely play hob with a sharp one.

Miter Marking Appliance

In Fig. 260 is shown a substitute for the ordinary miter box. The construction of it is indicated quite clearly in the sketch, but some little explanation will be needed before either its con-

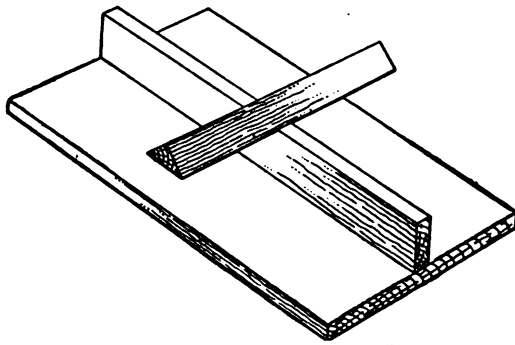


Fig. 260.—A Miter Marking Appliance.

struction or capabilities are thoroughly understood. As to the construction, it consists of a bed piece or bottom with another piece fixed to it along the center of its width. The angles formed between these two pieces should be as square as possible. Across the upper edge of the center piece and at right angles with it is fixed a strip, the sides of which are beveled to an angle of 45 degrees. Made in this way the appliance will mark what is commonly called the "square miter." In use, the molding or whatever is to be marked is laid in the angle formed by the two lower pieces and a flat-sided pencil is laid on the beveled strip so that its point touches the molding; then while keeping the pencil flat on the strip, draw it along so that a mark is made by it right

across the width of the molding. You now have the molding marked for either an external angle miter joint or an internal angle coped joint, depending upon which end of the molding you use.

It is only in special cases that the tool is of benefit in cutting the ordinary outside miter, but for coped joints its advantage is at once apparent, especially for material that is too wide or bulky for the ordinary miter box. If some angle other than that of 45 degrees is needed the beveled strip must be altered to suit, or if a square line is required across a large molding a square-edged strip is used in place of the beveled one.

The appliance as shown in Fig. 260 is perhaps more helpful to the pattern maker than to the carpenter, especially in pipe and core box work, but the principle upon which it works can be made useful to the carpenter in a number of different ways. Once it is thoroughly understood miters of almost every conceivable size and angle can be marked by means of it.

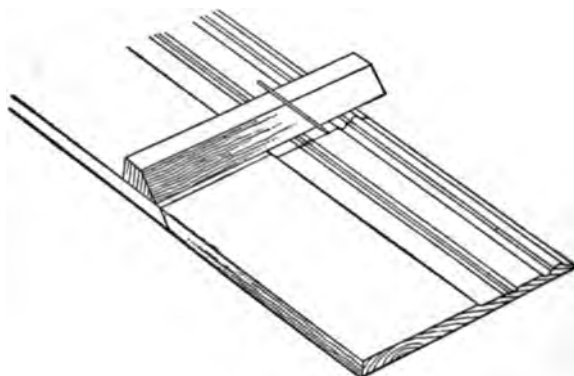


Fig. 261.—Applying the Principle of Fig. 260 in a Different Manner.

The intelligent student will at once perceive that in many cases it is not necessary to make the lower portion of the device at all, the beveled strip being all that is required. Suppose you wish to mark a coped joint on a piece of 12-in. molded base, no matter whether it be for the square corner of a room or the octagon angle of a bay window. Take a strip of the correct

bevel, which is the same as the miter of the angle, and lay it square across the piece of base. Run your pencil along the beveled side, keeping it flat on the strip and letting the point of it follow the outline of the molding as illustrated in Fig. 261 of the sketches. This is quicker than scribing with the compasses, and with a little practice will be found more accurate, especially for odd-shaped angles. Using it in this way the strip can be turned around so that it is only necessary to bevel one side of it, or each side may be beveled to a different angle to suit different miters.

CHAPTER XX

THE SHOP DOCTOR

MANY large manufacturing plants nowadays have a space set aside for hospital and first aid purposes, with either a doctor or trained nurse in constant attendance. This, however, was not what the writer had in mind when he headed the present chapter.

Meaning of the Title

Wherever a number of men are constantly working together, as in a shop, you will find them all going to some one man for assistance in such matters as extracting slivers or removing grit from the eye. This sort of work devolves to him because of his natural qualifications for it, such as steady hands and good eyesight, and he is known—in some localities at least—as the shop doctor.

Be Prepared for Emergencies

All mechanics working with edge tools are liable to such minor injuries as cut fingers, and one would naturally suppose they would be prepared for these emergencies. A roll of narrow gauze bandage can be obtained at a drug store for a few cents, and will take up little room in the tool chest or clothes cupboard; yet how often we see a man with a cut finger going all over the place looking for something to tie it up with, finally having to make shift with a strip of dirty handkerchief or a piece of the lining of an old coat.

Danger of Infection

The chief danger from these minor injuries is their liability to infection, and when we read and hear of so many cases of blood poisoning arising from the scratch of a rusty nail or something similar, it seems strange that workmen are not better prepared personally to attend to these matters.

Old-time Remedies

The old-time workmen had three general remedies they considered infallible. They were, turpentine, shellac, and a wad of chewed tobacco. We say the old-time workmen, but we might add that there are many present-day workmen who hold the same views.

These remedies are somewhat heroic, to say nothing else. One of the writer's most vivid memories of his apprenticeship days, is of getting his finger smashed under a steel beam and having some good samaritan (?) cover it all over with a coating of shellac. He has managed to get along without shellac in his medicine chest ever since.

One of the best remedies for a torn or bruised finger is hot water. Not warm water, hot water, hotter than you can bear it, so hot that you are only able to stick the injured member in and withdraw it immediately. Do this a few times and see if the pain doesn't disappear.

A Good Disinfectant

One of the best disinfectants is carbolic acid. Wash the cut or bruise with hot water containing a small per cent. of carbolic acid and there will be little danger of the wound getting poisoned. It isn't possible for the writer to state the proportion of carbolic acid and water required, for the following reason: Carbolic acid is a deadly poison, and different States make different laws as to the sale of it and the strength of the solution that may be sold. In some States, carbolic acid in less than pint quantities can only be obtained in a 10 per cent. solution. With this strength it will require a teaspoonful to the cup of water for a disinfectant; with the full-strength article only a few drops are needed. Any one purchasing carbolic acid will be compelled to state for what purpose they require it, and it will be best to obtain at that time instructions from the druggist regarding its use.

In the old shop we used to keep the water in the outer vessel of the glue-pot perfectly clean at all times, and as the glue-pot was almost constantly in use, we usually had a supply of hot

water. Where there is no hot water nor any chance of obtaining some readily, the same treatment with cold water is better than nothing.

Handling Bad Wounds

Do not touch bad wounds with the bare hands; where it becomes necessary to handle badly crushed fingers or wounds of a like nature, first wash the hands in sterilized water or—what is perhaps better—cover them with clean sterilized gauze bandage.

Perhaps the writer ought to have stated at the beginning that he doesn't intend this for a course in first aid to the injured. His attention has been drawn to the fact that there are many workmen who have given these matters neither thought nor study, and this is written more for the purpose of turning their thoughts in that direction than for supplying the necessary information.

Information on the subject can be obtained from some authentic medical work, or more properly from a practical surgeon, and all workmen should endeavor to obtain some knowledge along these lines for use in emergencies. More especially workmen holding responsible positions, such as foreman and others, who are quite frequently responsible both for the work done and the safety of the men doing it.

Accidents of a Serious Nature

All injuries of a serious nature should, at the earliest possible moment, have the attention of a physician, and as a general rule the less the patient is moved or handled prior to his appearance the better. The average man at the scene of a serious accident is very liable to let his feelings get the better of his judgment or, as it is commonly expressed, "he loses his head." He is so anxious to do something for the relief of the sufferer that he often makes matters worse instead of better, and not infrequently runs into serious danger himself. Almost every day instances of this kind may be found in the newspapers, and without doubt some of the readers could testify to the same thing from personal experience.

The writer knows of an instance where a workman employed in a large brewery descended into an empty vat and was overcome by the poisonous gas at the bottom. Three of his fellow-workmen went to his rescue one after the other, each succumbing in his turn; all four were dead before help reached them. At another time a workman in a section gang on an electric railroad in some manner got hold of the third rail with both hands. His companions coming to his assistance took hold of him, one behind the other, until there was a line of five men twisting and contorting under the influence of the electric current. As in the previous case, these men took hold one after the other, and the fate of those who had gone before did not seem to teach the last man anything.

The foreman of this gang was at some distance, and by the time he had arrived every man had taken hold of his fellow. He pried the first man loose from the rail with a wooden fence post, but not before he had been burnt to death. The other four recovered.

Electrical Accidents

In case of an electrical accident, the first thing to remember is to protect yourself. If you do not your efforts will avail the victim nothing and there will be two patients instead of one. If possible, shut off the current; put on rubber boots or gloves if they are at hand, and try to find a dry piece of board or other insulating material to stand on. These precautions may seem cold-blooded at the time, but an instant's forethought will show not only the wisdom but the absolute necessity of them. Forethought is the proper word to use, for in many of these cases there is never a chance for an afterthought.

It was not the writer's intention to say so much on this theme, but if what he has written is the means of turning only one man's thoughts in the direction of personal safety at a crucial moment, it will not have been written in vain. At the same time it may be the means of causing some one better qualified to take up the matter in a more thorough manner.

Burns and Scalds

For burns and scalds apply a solution of common baking soda, one tablespoonful to half a glass of water, and cover with clean gauze. For the immediate treatment of severe burns, where the service of a physician cannot be obtained, remove the clothing by cutting it away, saturating it with oil if it sticks, and dressing the wound a little at a time. Exclude the air by covering the surface with oil or vaseline. In the absence of these, cover with corn starch or flour.

Extracting Slivers

It was stated in the foregoing that the shop doctor's work devolved to him because of his natural qualifications for it, but in some cases this class of work comes his way because he is the only one with any equipment for handling it.

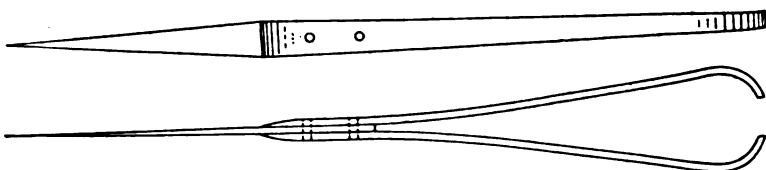


Fig. 262.—Silver Tweezers.

Fig. 262 shows a pair of tweezers for extracting slivers that the writer has carried for a number of years. They are made of three pieces of bandsaw blade riveted together as shown. One end is needle-pointed and is kept sharp, and in combination with the tweezers on the other end, proves much better for the purpose than the old-established knife blade and thumbnail.



Fig. 263.—Drawing Pen.

For extracting small slivers, one of the best things you ever tried is the head of an ordinary drawing or ruling pen, pictured in Fig. 263. Every second-hand store window displays a number of these. Most of them are past their usefulness as drawing

tools and may be bought for a few cents. With the handle removed, the head is so small it can be carried without trouble either in the purse or loose in the pocket.

Jeweler's Eye-Glass

A jeweler's eye-glass is a useful adjunct for a person who has much of this class of work to do for others, especially for such work as removing cinders from the eye.

Foreign Matter in the Eye

Foreign matter in the eye is perhaps the most frequent of all the minor accidents that fall to the lot of the mechanic, and much pain is often suffered from this cause. There are many implements and schemes in use amongst workmen for doctoring this class of accident, some of them comparatively harmless, others most dangerous. The writer knows a man whose favorite implement is a sharp knife blade. With it he is prepared to attempt the removal of anything from the eye, even if it be embedded in the eyeball. Up to the present he has had invariable success, but there are many people (the writer amongst them) who do not consider a knife blade a proper instrument for the amateur surgeon to use around so delicate and valuable an organ as the human eye.

One very popular treatment that we often hear mentioned is, "Rub the other eye." This is the same as saying, leave the affected eye alone. Rubbing the other eye merely gives the patient something to do and helps to take his mind off his other troubles while Nature is doing her best to wash out the obstruction. This she can usually accomplish unless the cinder, or whatever it is, is embedded in the flesh or eyeball, in which case rubbing the other eye is of about as much use as scratching the top of your head or pulling the tips of your ears.

A piece of soft tissue paper rolled to a point, with the end moistened, will answer for some cases; and a medicine dropper is very handy for removing small specks. The medicine dropper should be fitted with a much larger bulb than is usually supplied with it. The bulb can be obtained at any store dealing in

photo and camera supplies. A magnet can be used for removing pieces of iron or steel, but the best all-round implement of all for this work is now about to be described.

Take a hair from the head, form it into a loop and tie it to the end of a match, or a sliver of wood, with fine thread as shown in Fig. 264. The hair is so pliable that it may rest on the eyeball and be drawn across it without causing pain, and particles



Fig. 246.—For Removing Grit from the Eye.

of grit, steel, or other substances, even those that have become embedded in the eyeball, can be removed with it by trying it first from one side and then from the other, until you finally hook the loop over an edge of the substance and remove it.

Different degrees of stiffness in the loop may be obtained by making it larger or smaller, and with the aid of a mirror this little implement can, in a case of necessity, be used by the patient himself.

APPENDIX

ECONOMICAL BUILDING CONSTRUCTION

THERE are many items that enter into the construction of a building, and when, as is often the case, it becomes necessary to cut down the cost it is a matter of considerable study and calculation to discover which item can be most easily dispensed with or which, if any, of them are increasing the cost out of due proportion. It requires a very thorough knowledge of the practical side of the carpenter's business to be able to pick out these latter items, but it is the intention of the writer in the present article to describe one or two instances taken from his own experience that may possibly prove of interest.

Effect of Location on Cost

It is a long way from one side of this country of ours to the other, and not a few of these items of cost have to do with the varied building practices in different localities. In the East 16 ft. is the longest ceiling, flooring or siding obtainable—13 ft. being perhaps the length most generally used. In the West this material can be had in lengths up to 30 ft. Every one appreciates the fact that this longer material means less joints for the workman to fit, but there are other points in connection with it not so generally realized. Where the ceiling, flooring or siding must be cut so as to bring the joint on a stud or joist, every joint means a certain amount of waste, and every board, long or short, has two waste ends. It does not take much figuring to prove that 6 in. of split ends on a 10-ft. board is a larger percentage of waste than 6 in. on a 30-ft. board.

Different Methods of Fitting Siding and Corner Boards

Another item in which locality has an effect upon cost is the fixing of corner boards and outside casings. In some parts of the

say it, but it took nearly twice as long to fit the plugging as it did to put on the rustic, so that this little scheme increased the cost of the labor for the rustic nearly 200 per cent. This would not have been quite so bad if there had been an improvement in the appearance, but if you will take the word of the fellow on the job, despite all our care in fitting the plugs it would have been an improvement to have omitted them.

Board and Batten Construction

Another thing that usually deceives the designer is board-and-batten construction. Some time ago we built two houses near each other; the first we covered with rustic—for “rustic” read “drop siding” or “shiplap,” according to the choice of the reader—the second with boards and battens. I was certainly surprised to find that the board-and-batten construction had been introduced into the second house in order to lower the cost. Any one who has done any of this sort of work knows that to make it look like anything at all it is necessary to have the spacing of the battens pretty nearly equal. For instance, it will never do to space the battens along the side of the building on 22-in. centers and then at the corner have two of them only 3 in. apart. You must rip an inch or so off the last two or three boards so as to give the battens a more symmetrical appearance, and the same thing must often be done at the doors and windows. Under these conditions it takes longer to put up the boarding than it does to put on “rustic,” and then it takes longer to put on the battens than it does to put up the boarding. The battens have to be fixed straight and plumb, equally spaced and cut to fit in between the frieze at the top and the beveled base at the bottom.

Diagonal Boarding

Diagonal boarding has been the cause of many heated arguments and there is always room for discussion on this subject. Although you will not find two people of the same mind as to its merits, everybody is agreed that it is costly both as regards labor and material. There are people who claim great merit for

the diagonal boarding as a method of bracing the building. Everybody is entitled to his own opinion and there is no use beating around the bush, so I stand right up in meeting and declare that diagonal boarding for bracing purposes has no merit whatever over horizontal boarding—that is, when the

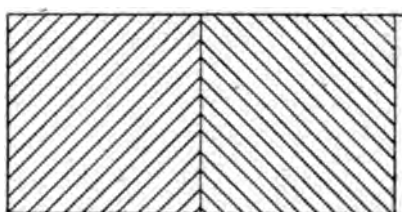


Fig. 267.—Proper Method of Diagonal Boarding.

diagonal boarding is properly applied, as shown in Fig. 267. When put on, as in Fig. 268, nine times out of ten—yes, ten times out of ten—it will throw the building out of plumb in the direction of the arrow. This is something the writer has never seen explained before, and is not theory but was brought to his notice by actual experience. It is the shrinking of the boarding that causes the trouble, and whether little or much it is always there.

On the occasion mentioned the building was one story high with a half pitch roof. The boarding was 1 x 12 in. mountain pine, very green, and two days of hot sun shrunk the boards until in some cases there was more than

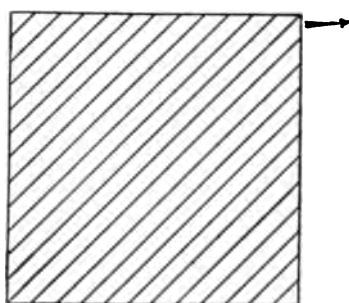


Fig. 268.—Incorrect Method of Diagonal Boarding.

$\frac{1}{2}$ in. space between them, and threw the gable end of the building $\frac{5}{8}$ of an inch out of plumb in 12 ft. If the reader will examine Fig. 269 it will perhaps help to explain how the shrinking of the lumber causes this trouble. In the illustration a short piece of board is shown nailed diagonally to one stud; turn the paper until the piece of board stands vertically and then

imagine the board shrinking. Notice that the nails will not pull along the stud toward each other—as they would if the board were nailed at right angles—but will move in the direction of the dotted arrows, causing a turning motion of the stud. This

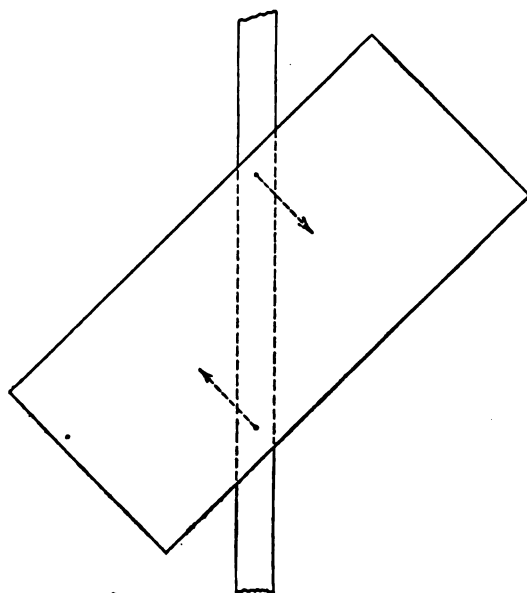


Fig. 269.—Showing the Effect of Shrinking of Diagonally Nailed Boarding.

turning effect would not be serious if there were any other bracing in the walls, but the diagonal boarding is being put on for bracing purposes, and as there is nothing to counteract the effect of it, over to starboard the building goes.

When the boarding is put on, as shown in Fig. 267, one side counteracts the other, yet I do not think this system as good as horizontal boarding, because of the unbroken joint in the center. If we saw a man put on horizontal boarding, making all his joints on one stud, we'd yell our heads off at him, and yet within 100 yards of the writer's home an expensive residence is being constructed with diagonal boarding put on in just that way.

One Serious Objection to Horizontal Boarding

There is one serious drawback to horizontal boarding, and that is, it cannot be covered with clapboards or siding and produce a good job. It is all right when the walls are to be covered with shingles, but for siding the shrinking of the wide inner boards will either split the outer ones or put some big joints in them. For work of this kind the writer, if left to himself, cuts in two or three rows of horizontal girts or "nailers" between the studs and puts the boarding on vertically. Taking into consideration the waste of material and extra time required for the diagonal boarding the vertical boarding is the cheaper of the two (even with the added cost of the girts), and when you have the siding properly nailed at right angles with it—well! if you ever see anything that will twist it out of shape you'll hardly be in a position to tell about it.

Herringbone Versus Solid Bridging

This diagonal boarding talk for some reason raises thoughts of herringbone bridging for floor joists. The writer has not put in any herringbone bridging for years and does not expect to unless he should drop down the scale to where he must work under some other fellow's directions again. Even then he'll try to make the other fellow see the matter from his standpoint. Herringbone bridging is a job on which the average carpenter can use up a lot of time. Many contractors in these parts get their bridging cut to the proper length and bevel at the mill so as to save a little on this item. Any "dub" can cut and nail the solid bridging and the herringbone style must be well fitted and well nailed, indeed, to be equal to it. For material there are usually one or two pieces of lumber too crooked to use for joists that may be cut up to advantage for this purpose or perhaps there may be some short ends. Even when so much of it is required that a special order is necessary, there is not much difference in the cost of one piece of 2 x 8 and two pieces of 2 x 3.

Most people when fixing solid bridging put it in place in a

straight row, and most architects show it on their drawings in the same manner. The writer sets every alternate piece on opposite sides of a straight line, as indicated in Fig. 270 of the

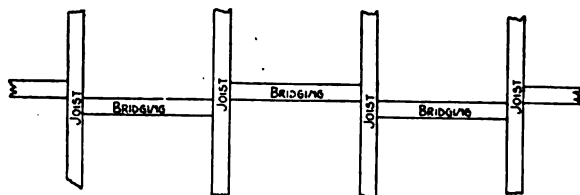


Fig. 270.—Plan of Solid Bridging.

sketches, and instead of toenailing it drives his nails through the joists—the staggering of the pieces making this easily possible.

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